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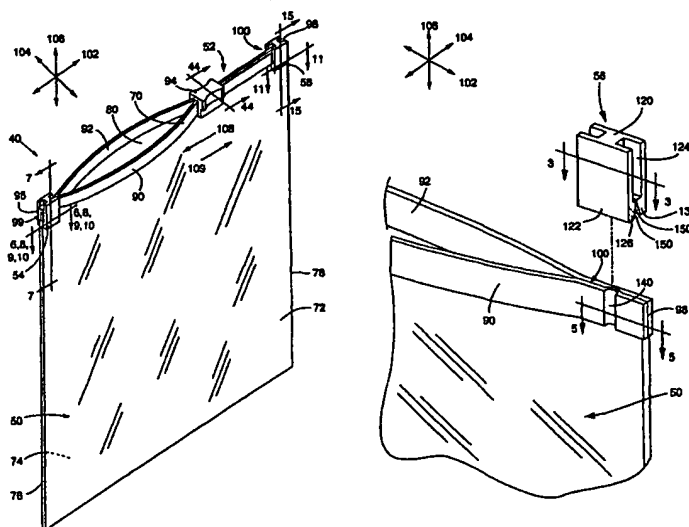
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(54) Title: END STOP FOR CLOSURE DEVICE



(57) Abstract: A container (40) is disclosed that includes a bag (50), a closure device (52), and an end stop (54, 56) having a peg (128). The closure device (52) includes first and second interlocking fastening strips (90, 92) having an end portion (99, 100) with a notch (140) and a slider (94) slidably disposed on the fastening strips (90, 92) for facilitating the occlusion (108) and deocclusion (109) of the fastening strips (90, 92). The end stop (54, 56) is mechanically mounted in complementary relation to the closure device (52) by disposing the peg (128) within the notch (140). The end stop (54, 56) can have several different configurations.

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END STOP FOR CLOSURE DEVICEFIELD OF THE INVENTION

The present invention relates generally to
5 containers and, more particularly, to a closure device
with an end stop. The invention is particularly well
suited for use on flexible storage containers, including
plastic bags.

10

BACKGROUND OF THE INVENTION

The use of closure devices for fastening storage
containers, including plastic bags, is generally known.
Furthermore, the manufacture of closure devices made of
plastic materials is generally known to those skilled in
15 the art, as demonstrated by the numerous patents in this
area.

A particularly well-known use for closure devices is
in connection with flexible storage containers, such as
plastic bags. In some instances, the closure device and
20 the associated container are formed from thermoplastic
materials, and the closure device and the sidewalls of the
container are integrally formed by extrusion as a single
piece. Alternatively, the closure device and sidewalls of
the container can be formed as separate pieces and then
25 connected by heat sealing or any other suitable connecting
process. In either event, such closure devices are
particularly useful in providing a closure means for
retaining matter within the bag.

A conventional closure device typically utilizes
30 mating fastening strips or closure elements which are used
to selectively seal the bag. In addition, a slider can be
provided for use in opening and closing the fastening
strips. The slider can include a separator which extends
at least partially between the fastening strips. When the
35 slider is moved in the appropriate direction, the
separator divides the fastening strips and opens the bag.

When the fastening strips are occluded and deoccluded, the seams of the sidewalls are subjected to stress. Further, when a slider is used with the fastening strips, the slider can translate along the fastening strips until it abuts either seam. The interaction of the slider with either seam also subjects the seams to stress. The seam stress can cause the seams to fail and split, limiting the usefulness of the bag.

SUMMARY OF THE INVENTION

The present invention is directed toward a container having an end stop mounted to a bag and toward the structure of the end stop that acts to attach the end stop to the bag. According to the teachings of the present invention, the container includes a bag and a closure device with a pair of end stops. The closure device includes interlocking fastening strips disposed along respective edge portions of opposing sidewalls of the bag and a slider slidably disposed on the interlocking fastening strips for facilitating the occlusion and deocclusion of the fastening strips when moved towards first and second ends thereof. To complement the closure device, a pair of end stops disposed on the fastening strips, one end stop adjacent each end of the fastening strips, is provided. The end stops increase the durability of the closure device and the container.

A container, constructed according to the teachings of the present invention, is provided with an end stop that is mechanically mounted to the bag. To facilitate the mechanical mounting, the end stop is provided with a peg and a plurality of shoulders. The fastening strips are secured together at the first and second ends by end portions. Each end portion includes a notch that is adapted to receive the peg of the end stop. The peg and the notch cooperate to retentively lock the end stop in place along a longitudinal axis of the fastening strips.

The shoulders are adapted to retentively lock the end stop in place along a vertical axis of the fastening strips.

In another aspect of the invention, the end stop includes a plurality of ribs and a plurality of shoulders.

5 The end portions of the fastening strips need not include a complementary notch. Instead, the ribs of the end stop act to crimp the fastening strips to retentively lock the end stop in place along the longitudinal axis of the fastening strips. Further, by adapting the ribs to
10 include a ramped portion and a retaining surface, the ribs can act to retentively lock the end stop in place along the vertical axis of the fastening strips, as well. Accordingly, the shoulders can be omitted.

In addition, the end stop can include a plurality of
15 posts and a plurality of shoulders. The posts act as point contacts that crimp the fastening strips to retentively lock the end stop in place along the longitudinal axis of the fastening strips.

In another aspect of the invention, an end stop can
20 include a pair of hinged retaining portions, each having a shoulder, that can be rotated about a body portion toward a first flange with a peg and a second flange. Each flange includes a catch. Each shoulder includes a
25 retainer portion that acts to secure the catch. The end stop can be mounted to a pair of fastening strips, including an end portion with a notch, by aligning the peg with the notch. The hinged retaining portions can be
30 rotated about the body portion until the retaining portion engages the catch. In this position the shoulders act to retentively lock the end stop in place along the vertical axis of the fastening strips.

To make the container including the mechanically-mountable end stop, a double end stop can be provided.

The present invention will become more readily
35 apparent upon reading the following detailed description of the exemplified embodiments and upon reference to the accompanying drawings herein.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a container according to the present invention in the form of a plastic bag;

5 FIG. 2 is a fragmentary perspective view of the container in FIG. 1 with an end stop removed from a pair of fastening strips for illustrative purposes;

FIG. 3 is a cross-sectional view of the end stop taken along the line 3-3 in FIG. 2;

10 FIG. 4 is an end view of the end stop in FIG. 2;

FIG. 5 is a cross-sectional view of the bag taken along the line 5-5 in FIG. 2;

FIG. 6 is a cross-sectional view of the container taken along the line 6-6 in FIG. 1;

15 FIG. 7 is a cross-sectional view of the container taken along the line 7-7 in FIG. 1;

FIG. 8 is a fragmentary cross-sectional view of another embodiment of a container taken along the line 8-8 in FIG. 1 that illustrates an end stop with a pair of
20 opposing pegs and a end portion with a pair of respective complementary notches for the pegs;

FIG. 9 is a fragmentary cross-sectional view of another embodiment of a container taken along the line 9-9 in FIG. 1 that illustrates an end stop with four pegs and
25 a end portion with a pair of respective complementary notches for the pegs;

FIG. 10 is a fragmentary cross-sectional view of another embodiment of a container taken along the line 10-10 in FIG. 1 that illustrates a end portion that includes
30 a relief portion;

FIG. 11 is a fragmentary cross-sectional view of another embodiment of a container taken along the line 11-11 in FIG. 1;

35 FIG. 12 is an end view of the end stop shown in FIG. 11;

FIG. 13 is a side elevational view of the end stop in FIG. 11;

FIG. 14 is a bottom plan view of the end stop in FIG. 11;

FIG. 15 is a sectional view taken along the line 15-15 in FIG. 1;

5 FIG. 16 is a fragmentary cross-sectional view of another embodiment of a container;

FIG. 17 is a fragmentary cross-sectional view of another embodiment of a container;

10 FIG. 18 is a fragmentary cross-sectional view of another embodiment of a container;

FIG. 19 is a fragmentary cross-sectional view of another embodiment of a container;

FIG. 20 is a fragmentary end view of the containers shown in FIGS. 16-19;

15 FIG. 21 is a fragmentary cross-sectional view of another embodiment of a container;

FIG. 22 is a fragmentary cross-sectional view of another embodiment of a container;

20 FIG. 23 is a fragmentary cross-sectional view of another embodiment of a container;

FIG. 24 is a fragmentary cross-sectional view of another embodiment of a container;

FIG. 25 is a fragmentary end view of the containers shown in FIGS. 21, 22, and 24;

25 FIG. 26 is a fragmentary end view of the container shown in FIGS. 23;

FIG. 27 is a perspective view of another embodiment of an end stop wherein the end stop includes a pair of hinged retaining portions;

30 FIG. 28 is a top plan view of the end stop in FIG. 27;

FIG. 29 is an end view of the end stop in FIG. 27;

FIG. 30 is a side elevational view of the end stop in FIG. 27;

35 FIG. 31 is a cross-sectional view taken along the line 31-31 in FIG. 28;

FIG. 32 is a fragmentary perspective view of another embodiment of a container including the end stop shown in FIGS. 27-31 removed from a pair of fastening strips for illustrative purposes;

5 FIG. 33 is a fragmentary cross-sectional view of the container taken along lines 33a-33a and 33b-33b in FIG. 32 that illustrates the end stop inserted on the fastening strips;

10 FIG. 34 is a cross-sectional view as in FIG. 33 that illustrates the hinged retaining portions moved toward a closed position;

FIG. 35 is a cross-sectional view as in FIG. 33 that illustrates the hinged retaining portions moved closer toward the closed position;

15 FIG. 36 is a cross-sectional view as in FIG. 33 that illustrates one of the hinged retaining portions in the closed position;

FIG. 37 is a top plan view of a double end stop;

20 FIG. 38 is a side elevational view of the double end stop in FIG. 37;

FIG. 39 is an end view of the double end stop in FIG. 37;

FIG. 40 is a cross-sectional view of the double end stop taken along line 40-40 in FIG. 38;

25 FIG. 41 is a fragmentary cross-sectional view of a bag assembly;

FIG. 42 is a fragmentary cross-sectional view of a container assembly that includes the double end stop shown in FIG. 40 and the bag assembly shown in FIG. 41;

30 FIG. 43 is a side elevational view of another embodiment of a container that is made from the container assembly in FIG. 42;

FIG. 44 is a cross-sectional view of an embodiment of a container taken along line 44-44 in FIG. 1;

35 FIG. 45 is a cross-sectional view of another embodiment of a container;

FIG. 46 is a cross-sectional view of another embodiment of a container; and

FIG. 47 is a cross-sectional view of another embodiment of a container.

5

DESCRIPTION OF THE EXEMPLIFIED EMBODIMENTS

In summary, a container, constructed according to the teachings of the present invention, includes a bag and is provided with an end stop mounted to the bag by a mounting process. To facilitate the mounting process, the end stop is provided with a peg. When the end stop is mounted to the bag, the peg is adjacent the bag. The peg fits within a notch in the bag during the mounting process. To facilitate insertion of the end stop over a pair of fastening strips, the end stop can be provided with hinged retaining portions.

Turning to the Figures, FIG. 1 illustrates an embodiment of a container 40 in the form of a plastic bag 50 having a sealable closure device 52, a first end stop 54 and a second end stop 56.

The bag 50 includes a top end 70, a first sidewall 72 and a second sidewall 74 joined at first and second seams 76, 78 to define a compartment 80 accessible through the open top end 70 but sealable by means of the closure device 52.

The closure device 52 includes a first fastening strip 90, a second fastening strip 92, a slider 94, a first end 96, and a second end 98. The fastening strips 90, 92 and the slider 94 have a longitudinal X axis 102, a transverse Y axis 104 and a vertical Z axis 106. The transverse Y axis 104 is perpendicular to the longitudinal X axis 102. The vertical Z axis 106 is perpendicular to the longitudinal X axis 102 and the vertical Z axis 106 is perpendicular to the transverse Y axis 104.

To allow the bag 50 to be opened and closed, the first and second fastening strips 90, 92 are provided.

The first fastening strip 90 is attached to the first sidewall 72 near the top end 70 of the bag 50. The second fastening strip 92 is attached to the second sidewall 74 near the top end 70 of the bag 50. The fastening strips 90, 92 are located across from and substantially parallel to each other and are adapted to be interlocked between the first end 96 and the second end 98. Interlocking the strips 90, 92 occludes the strips 90, 92 and closes the top end 70. Separating the interlocked fastening strips 90, 92 deoccludes the strips 90, 92 and opens the top end 70.

The fastening strips 90, 92 are secured together at the first and the second ends 96, 98 to form end seals. The fastening strips 90, 92 can include end portions 99, 100. The end portions 99, 100 can be held together. For example, the end portions 99, 100 can be melted together by heat sealing, ultrasonic sealing, or other operation. In another example, the end portions 99, 100 can be held together by using an adhesive or by some other means.

To facilitate the occlusion and deocclusion of the fastening strips 90, 92, the slider 94 is provided. The slider 94 is mounted onto the fastening strips 90, 92 so that the slider 94 is restrained from being removed from the fastening strips 90, 92 in the Z axis 106 but free to slide along the X axis 102. The slider 94 engages the fastening strips 90, 92 so that moving the slider in the appropriate direction along the X axis 102 either occludes or deoccludes the fastening strips 90, 92.

Referring to FIG. 1, in the illustrated embodiment, when the slider 94 moves toward the first end 96 in an occlusion direction 108, the fastening strips 90, 92 are interlocked. When the slider 94 moves toward the second end 98 in a deocclusion direction 109, the fastening strips 90, 92 are separated. The occlusion and deocclusion directions 108, 109 are substantially parallel to the X axis 102. When the slider 94 is at the

first end 96, the bag 50 is sealed. When the slider 94 is at the second end 98, the bag 50 is fully open.

To complement the closure device and to protect the seams 76, 78, the first and second end stops 54, 56 are
5 disposed on the fastening strips 90, 92. The respective first and second end stops 54, 56 are adjacent the first and second ends 96, 98 of the fastening strips 90, 92. The end stops 54, 56 increase the durability of the closure device 52 and the bag 50.

10 Referring to FIG. 1, the illustrative end stops 54, 56 are top-mounted. Viewed from above, the end stops 54, 56 are H-shaped. The end stops 54, 56 are disposed on the fastening strips 90, 92 such that the longitudinal axes of
15 the end stops 54, 56 are substantially parallel to the Z axis 106. The first end stop 54 is adjacent the first end 96. The slider 94 can translate along the X axis 102 in the occlusion direction 108 until the slider 94 contactingly engages the first end stop 54. The first end stop 54 prevents the slider 94 from moving further in the
20 occlusion direction 108. The second end stop 56 is adjacent to the second end 98. The slider 94 can translate in the deocclusion direction 109 until the slider 94 contactingly engages the second end stop 56. The second end stop 56 prevents the slider 94 from moving
25 further in the deocclusion direction 109. The end stops 54, 56 can retain the slider 94 on the fastening strips 90, 92 such that the slider 94 can translate between the end stops 54, 56 and such that the end stops 54, 56 prevent the slider 94 from contactingly engaging the seams
30 76, 78.

The first and second end stops 54, 56 are identical to each other, although they need not be. It will be understood that the description of the first end stop 54 is applicable to the second end stop 56 and vice versa.
35 Any feature, variation, or alternative construction described with respect to the first end stop 54 or the second end stop 56 is applicable to the other end stop.

The first end stop 54 is mounted onto the bag 50 at the top end 70. The end stop 54 straddles the fastening strips 90, 92. The end stop 54 projects above the top end 70 and below the fastening strips 90, 92.

5 According to the teachings of the present invention, each end stop is mechanically mounted to the bag 50. Referring to FIG. 2, the end stop 56 includes an H-shaped body portion 120 with a first and a second flange 122, 124 depending therefrom. Referring to FIGS. 3 and 4, the
10 first flange 122 includes a first and a second shoulder 126, 127 and a peg 128. The second flange 124 includes a first and a second shoulder 130, 131.

The first and second shoulders 126, 127 of the first flange 122 project inwardly toward the second flange 124.
15 The first and second shoulders 126, 127 are respectively disposed adjacent first and second edges 132, 133 and are disposed at the bottom of the first flange 122, as shown in FIG. 4. The peg 128 is disposed between the first and the second shoulders 126, 127 and extends longitudinally
20 along the end stop 56. The peg 128 projects inwardly from the first flange 122 toward the second flange 124.

The first and second shoulders 130, 131 of the second flange 124 project inwardly toward the first flange 122. The first and second shoulders 130, 131 are respectively
25 disposed adjacent first and second edges 134, 135 and are disposed at the bottom of the second flange 124, as shown in FIG. 4. The first and the second shoulders 130, 131 of the second flange 124 respectively oppose the first and the second shoulders of the first flange 122.

30 Referring to FIGS. 2 and 5, the bag 50 includes a notch 140 within the end portion 100. The notch 140 is configured to receive the peg of the end stop 56. Referring to FIG. 5, the end portion 100 includes a portion 144 of both the first and the second fastening
35 strips 90, 92 that extends from the end 98 to a point 146 beyond the notch 140 wherein the fastening strips 90, 92 are fused together. The point 146 is in spaced relation

with the notch 140 a distance sufficient to provide resistance to the stresses generated during the occlusion and deocclusion of the fastening strips 90, 92.

As described previously, the strips 90, 92 can be held together by any suitable method, such as, heat sealing or ultrasonic sealing, for example. The notch 140 can be made by deforming a portion 148 of the end portion 100. The notch 140 can also be made by any other suitable method. For example, the notch can be made by removing a part of the end portion 100 by machining or plowing out the fastening strips. The notch can be made either at the same time as, or at a different time than, the melting step for making the end portion 100. Further, the notch can be made in the same step as, or in a different step than, the end portion 100. It will be understood that both, or either, the length of the end portion 100, measured along the X axis 102, and/or the location of the notch 140 can be varied.

Referring to FIG. 6, the end portion 99 at the first end 96 is similar to the end portion 100 at the second end 98, shown in FIG. 5. Referring to FIG. 6, the end portion 99 includes a notch 149 for the first end stop 54. The end stop 54 is in retentively locking relation with the bag 50 along the X axis 102. The peg 128 of the end stop 54 is disposed within the notch 149 of the bag 50 to provide a mechanical connection between the end stop 54 and the bag 50 that prevents the end stop 54 from moving relative to the bag 50 along the X axis 102.

Referring to FIG. 7, the end stop 54 is in retentively locking relation with the bag 50 along the Z axis 106. Each shoulder 126, 127, 130, 131 includes a beveled surface 150 and a retaining surface 152. The retaining surfaces 152 are retentively arranged with the fastening strips 90, 92. The shoulders 126, 127 of the first flange 122 and the shoulders 130, 131 of the second flange 124 are disposed with respect to the first and the second fastening strips 90, 92, respectively, such that

the retaining surface 152 of each shoulder 126, 127, 130, 131 is in retentively locking relation with the corresponding fastening strip 90, 92. The shoulders 126, 127, 130, 131 provide a mechanical connection between the end stop 54 and the bag 50 that prevents the end stop 54 from moving relative to the bag 50 upward along the Z axis 106. The body portion 120 of the end stop 54 retains the end stop 54 in place on the bag 50 and prevents the end stop 54 from moving relative to the top end 70 of the bag 50 downward along the Z axis 106.

The end stop 54 can be made, for example, by injection molding. It will be understood that the end stop 54 can be made within predetermined tolerances such that there is some play between the fastening strips 90, 92 and the shoulders 126, 127, 130, 131 and/or between the fastening strips 90, 92 and the body portion 120.

Referring to FIG. 2, to mechanically mount the second end stop 56 to the bag 50, the end stop 56 can undergo a mounting process wherein the peg of the end stop 56 is aligned with the notch 140 at the second end 98 of the bag 50 with the shoulders adjacent the fastening strips 90, 92. The end stop 56 is moved along the Z axis 106 so that each beveled surface 150 of the first flange 122 contacts the first fastening strip 90 and each beveled surface 150 of the second flange 124 contacts the second fastening strip 92. The first and the second flanges 122, 124 are resiliently flexible and can rotate about the body portion 120. The beveled surfaces 150 bear against, and move past, the fastening strips with the flanges 122, 124 flexing outward to accommodate the fastening strips. Once the shoulders clear the fastening strips, the flanges 122, 124 return to their normal position wherein the retaining surface 152 of each shoulder is placed in retentively locking relation with the corresponding fastening strip, as shown in FIG. 7.

Although the end stop 54 can achieve the desired locking arrangement in the X axis 102 with only a single

peg, it will be understood that the end stop can include a plurality of pegs. For example, FIG. 8 illustrates another embodiment of a container 240 having an end stop 254 with a pair of pegs 328, 332 projecting from first and second flanges 322, 324, respectively. The end stop 254 straddles an end portion 299. The pegs 328, 332 are offset from each other a predetermined distance 353 such that each peg 328, 332 fits within a respective notch 349, 351 on opposing sides of the end portion 299.

FIG. 9 depicts another embodiment of a container 440 having an end stop 454 with a pair of pegs 528, 529 projecting from a first flange 522 and a pair of pegs 532, 533 projecting from a second flange 524. The end stop 454 straddles an end portion 499. The pegs 528, 529 of the first flange 522 are in spaced relation to each other such that each peg 528, 529 fits within a respective notch 549, 551 on a side of the end portion 499 with the first fastening strip 490. The pegs 532, 533 of the second flange 524 are in spaced relation to each other such that each peg 532, 533 fits within a respective notch 553, 555 on the other side of the end portion 499 with the second fastening strip 492.

FIG. 10 depicts another embodiment of a container 640 that includes an end portion 699 with an optional relief portion 758. The relief portion 758 is disposed adjacent a first end stop 654 and acts to remove from the end stop 654 the stresses that are generated during the opening of the bag 650. When a user opens the bag 650 by spreading apart the sidewalls 672, 674 to insert matter into the bag 650, for example, stresses can be transmitted to the end stop 654. The relief portion 758 is disposed such that it can prevent those stresses from reaching the end stop 654, thereby preventing the spreading of the resiliently flexible flanges 722, 724 to the point where the end stop 654 could "pop" off of the bag 650. In addition, if the stresses are too great, then the sidewall 672 will tear at

the relief portion 758 and prevent the end stop 654 from being removed by "popping off."

The relief portion 758 includes a portion of the fastening strips 690, 692 that is melted together. The relief portion 758 can be fused using any suitable method, such as ultrasonic sealing or heat sealing, for example. The relief portion 758 can be made at the same time as the rest of the end portion 699 or at a different time. Further, the relief portion 758 can be made in the same operation as the end portion 699 or in a different step. It will be understood that another relief portion can be added to the bag adjacent the second end stop.

FIGS. 11-20 depict other embodiments of an end stop that can be mechanically mounted to a bag. The end stops shown in FIGS. 11-20 are exemplary of an end stop that includes a plurality of ribs for crimping and engaging the fastening strips to retentively lock the end stop in place with respect to the bag along the X axis 102. For example, referring to FIGS. 11 and 15, another embodiment of a container 840 includes an end stop 856 having a first flange 922 with three ribs 970 and a second flange 924 with a pair of ribs 971. Referring to FIG. 11, the ribs 971 of the second flange 924 are interdigitated with the ribs 970 of the first flange 922. Each rib 970, 971 terminates at a point which operates to engage an end portion 900 of the fastening strips 890, 892. The ribs 970, 971 are adapted to crimp the end portion 900 to lockingly retain the end stop along the X axis 102. For example, referring to FIG. 15, the rib 970 of the first flange 922 cooperates with the second flange 924 to crimp the end portion 900.

Referring to FIG. 12, the end stop 856 has a body portion 920 and shoulders 926, 927, 930, 931 that are similar to the body portion 120 and the shoulders 126, 127, 130, 131 of the second end stop 56 shown and described in FIGS. 1-4. The ribs 970 of the first flange

922 extend toward the second flange 924. The ribs 971 of the second flange 924 extend toward the first flange 922.

As shown in FIGS. 12, 13, and 14, each rib 970, 971 can include a triangular-shaped ramped portion 973 to facilitate the mounting process. When the end stop 856 is mechanically mounted to a bag, the ramped portions 973 bear against the fastening strips and facilitate any outward flexing of the first and the second flanges 922, 924.

FIGS. 16 and 20 depict another embodiment of a container 1040 that includes an end stop 1056 with a plurality of opposing ribs 1170, 1171 projecting from first and second flanges 1122, 1124, respectively. Referring to Fig. 20, the ribs 1170, 1171 are each barbed shaped in that each rib 1170, 1171 includes a ramped portion 1173 and a retaining surface 1175. For each rib 1170, 1171, the ramped portion 1173 and the retaining surface 1175 meet at a point 1177. The points 1177 grab the end portion 1100 to provide a mechanical connection between the end stop 1056 and the bag 1050 that prevents the end stop 1056 from moving relative to the bag 1050 upward along the Z axis 106. As seen in FIG. 16, the retaining surfaces 1175 are each triangular-shaped. The points 1177 act to crimp the end portion 1100 to retentively lock the end stop 1056 in place relative to the bag 1050 along the X axis 102.

FIGS. 17 and 20 depict another embodiment of a container 1240 that includes an end stop 1256 having a plurality of ribs 1370 projecting from a first flange 1322 and a plurality of opposing ribs 1371 projecting from a second flange 1324. Referring to FIG. 17, the ribs 1370 of the first flange 1322 each include a beveled surface 1372. The ribs 1371 of the second flange 1324 each include a beveled surface 1378 that opposes the beveled surface 1372 of the corresponding opposing rib 1370 of the first flange 1322. The end stop 1256 is similar to the

end stop 1056 shown and described in FIGS. 16 and 20 in other respects.

FIGS. 18 and 20 depict another embodiment of a container 1440 that includes an end stop 1456 having a plurality of ribs 1570 projecting from a first flange 1522 and a plurality of opposing ribs 1571 projecting from a second flange 1524. Referring to FIG. 18, the ribs 1570 of the first flange 1522 each include a beveled surface 1572. The ribs 1571 of the second flange 1524 each include a beveled surface 1578 that is complementary to the beveled surface 1572 of the corresponding opposing rib 1570 of the first flange 1522. The end stop 1456 is similar to the end stop 1056 shown and described in FIGS. 16 and 20 in other respects.

FIGS. 19 and 20 depict another embodiment of a container 1640 that includes an end stop 1656 having a pair of ribs 1770, 1772 projecting from a first flange 1722 and a plurality of interdigitating ribs 1780, 1782, 1784 projecting from a second flange 1724. Referring to FIG. 19, the ribs 1770, 1772 of the first flange 1722 each include a respective beveled surface 1774, 1776. The first and the third ribs 1780, 1784 of the second flange 1724 include a respective beveled surface 1786, 1788. The second rib 1782 of the second flange 1724 includes a planar end 1790.

Referring to Fig. 20, the second rib 1782 of the second flange 1724 has a ramped portion 1783 and a retaining surface 1785 that meet at an edge 1787. Each of the ribs 1770, 1772 of the first flange 1722 and the remaining ribs 1780, 1784 of the second flange 1724 has a ramped portion and a retaining surface that meet at a point. The end stop 1656 is similar to the end stop 1056 shown and described in FIGS. 16 and 20 in other respects.

FIGS. 21-26 depict other embodiments of an end stop that can be mechanically mounted to a bag. The end stops shown in FIGS. 21-26 are exemplary of an end stop that includes a plurality of posts for crimping and engaging a

pair of fastening strips to retentively lock the end stop in place with respect to the bag along the X axis 102. For example, FIGS. 21 and 25 depict another embodiment of a container 1840 that includes an end stop 1856 with a plurality of opposing posts 1970, 1971 projecting from first and second flanges 1922, 1924, respectively. Referring to Fig. 25, the posts 1970, 1971 are each configured to contact the end portion 1900 along the Z axis 106 at an intermediate point of the end portion 1900. Each post 1970, 1971 includes an edge 1977 that is in contact with the end portion 1900. As seen in FIG. 21, the posts 1970, 1971 act to crimp the end portion 1900 to retentively lock the end stop 1856 in place relative to the bag 1850 along the X axis 102.

The first and the second flanges 1922, 1924 each include a pair of shoulders 1926, 1927, 1930, 1931 that are similar to the shoulders 126, 127, 130, 131 of the end stop 56 shown and described in FIGS. 1-7. Referring to FIG. 25, each of the shoulders 1926, 1927, 1930, 1931 is in retentively locking relation with the corresponding fastening strip 1890, 1892 to provide a mechanical connection between the end stop 1856 and the bag 1850 that prevents the end stop 1856 from moving relative to the bag 1850 upward along the Z axis 106.

FIGS. 22 and 25 depict another embodiment of a container 2040 that includes an end stop 2056 having a plurality of posts 2170 projecting from a first flange 2122 and a plurality of opposing posts 2171 projecting from a second flange 2124. Referring to FIG. 22, the posts 2170 of the first flange 2122 each include a beveled surface 2172. The posts 2171 of the second flange 2124 each include a beveled surface 2178 that opposes the beveled surface 2172 of the corresponding opposing post 2170 of the first flange 2122. The posts 2170, 2171 engage the fastening strips 2090, 2092 and prevent the end stop 2056 from moving relative to the fastening strips 2090, 2092 along the X axis 102. The end stop 2056 is

similar to the end stop 1856 shown and described in FIGS. 21 and 25 in other respects.

FIGS. 23 and 26 depict another embodiment of a container 2240 that includes an end stop 2256 having a plurality of posts 2370 projecting from a first flange 2322 and a plurality of opposing posts 2371 projecting from a second flange 2324. Referring to FIG. 23, the posts 2370 of the first flange 2322 each include a beveled surface 2372. The posts 2371 of the second flange 2324 each include a beveled surface 2378 that is complementary to the beveled surface 2372 of the corresponding opposing post 2370 of the first flange 2322. The posts 2370, 2371 engage the fastening strips 2290, 2292 and prevent the end stop 2256 from moving relative to the fastening strips 2290, 2292 along the X axis 102. The end stop 2256 is similar to the end stop 1856 shown and described in FIGS. 21 and 25 in other respects.

FIGS. 24 and 25 depict another embodiment of a container 2440 that includes an end stop 2456 having a pair of posts 2570, 2572 projecting from a first flange 2522 and a plurality of interdigitating posts 2580, 2582, 2584 projecting from a second flange 2524. Referring to FIG. 24, the posts 2570, 2572 of the first flange 2522 each include a respective beveled surface 2574, 2576. The first and the third posts 2580, 2584 of the second flange 2524 include a respective beveled surface 2586, 2588. The second post 2582 of the second flange 2524 includes a planar end 2590. The posts 2570, 2572, 2580, 2582, 2584 engage the fastening strips 2490, 2492 and prevent the end stop 2456 from moving relative to the fastening strips 2490, 2492 along the X axis 102.

Referring to FIG. 25, the second post 2582 of the second flange has a planar surface 2587 that contacts the end portion 2500. Each of the posts 2570, 2572 of the first flange 2522 and the remaining posts 2580, 2584 of the second flange 2524 contacts the end portion 2500 at an edge 2577. The end stop 2456 is similar to the end stop

1856 shown and described in FIGS. 21 and 25 in other respects.

FIGS. 27-31 depict another embodiment of an end stop 2654 that includes a pair of hinged retaining portions 2770, 2772. Referring to FIG. 27, each retaining portion 2770, 2772 respectively includes a pair of legs 2774, 2776 and a shoulder 2778, 2780. Referring to Fig. 28, each retaining portion 2770, 2772 is generally U-shaped. Each pair of legs 2774, 2776 is attached at one end of each leg to a body portion 2720 by a respective pair of living hinges 2782, 2784. The shoulders 2778, 2780 are attached to the respective pair of legs 2774, 2776 at the other end of each leg.

Referring to FIG. 29, the retaining portions 2770, 2772 can rotate about the body portion 2720 toward a first and a second flange 2722, 2724, respectively. The first flange 2722 includes a rigid catch 2725 and a peg 2728. The second flange 2724 includes a rigid catch 2729. Except for the peg 2728, the first flange 2722 is similar to the second flange 2724. Accordingly, the description below with respect to the first flange 2722 is applicable to the second flange 2724.

Referring to FIG. 30, the first flange 2722 presents outwardly a flush, finished surface. The catch 2725 is an integral portion of the first flange 2722. The legs 2774 of the first retaining portion 2770 are in lateral, spaced relation to each other such that the legs 2774 can rotate toward the catch 2725 with the first flange 2722 fitting between the legs 2774.

Referring to FIG. 31, the shoulders 2778, 2780 each include a barb 2790, a resiliently flexible wall portion 2792, and a recessed channel 2794. Referring to FIG. 28, the channels 2794 and the barbs 2790 are generally disposed such that they are centered along the longitudinal midline of the end stop 2654. Each channel 2794 extends a distance greater than its respective barb 2790 between the respective legs 2774, 2776. Referring to

FIG. 31, each barb 2790 includes a ramped surface 2796 and a latch surface 2798. Each catch 2725, 2729 includes a contoured surface 2800 and a latch surface 2802. Each shoulder 2778, 2780 can cooperatively engage the
5 respective barb 2790 to act as a compression latch to capture the retaining portions 2770, 2772 in a closed position, as shown in FIG. 36.

FIGS. 32-36 depict another embodiment of a container 2640 and illustrate the end stop 2654, shown in FIGS. 27-
10 31, being mounted to a bag 2650. Referring to FIG. 32, the end stop 2654 is positioned over the bag 2650 such that the peg 2728 of the first flange 2722 aligns with a notch 2749 in an end portion 2699 of a pair of fastening strips 2690, 2692. The end stop 2654 can be disposed over
15 the fastening strips 2690, 2692 such that the peg 2728 fits within the notch 2749, as shown in FIG. 33. In FIG. 33, the hinged retaining portion 2770 is shown adjacent the first flange 2722. The retaining portion 2770 can be rotated toward the peg 2728 such that the barb 2790
20 contacts the catch 2725, as shown in FIG. 34. In FIG. 34, the ramped surface 2796 is in contact with the contoured surface 2800. As the first retaining portion 2770 is rotated toward the second flange 2724, the ramped surface 2790 bears against, and slips past, the contoured surface
25 2800. In turn, the wall portion 2792 flexes into the channel 2794 to allow the barb 2790 to move past the catch 2725. Referring to FIG. 35, the wall portion 2792 continues to flex into the channel 2794 until the latch surface 2798 of the barb 2790 moves past the latch surface
30 2802 of the catch 2725. Once the latch surfaces 2798, 2802 move past each other, the wall portion 2792 returns to its normal position, as shown in FIG. 36.

Referring to FIG. 36, the barb 2790 is fully seated upon the catch 2725 such that the respective latch
35 surfaces 2798, 2802 of the barb 2790 and the catch 2725 are in interfering contact with each other. The catch 2725 retains the barb 2790 such that the retaining portion

2770 is in the closed position. The shoulder 2778 is disposed below the first fastening strip 2690. Similarly, the second retaining portion 2772 can be moved to a closed position to place the second shoulder 2780 below the second fastening strip 2692. The shoulders 2778, 2780 provide a mechanical connection between the end stop 2654 and the fastening strips 2690, 2692, preventing the end stop 2654 from moving relative to the fastening strips 2690, 2692 and the bag 2650 along the Z axis 106.

It will be understood that variations can be made to the exemplary end stops described herein. For example, the number, shape, size, location, and/or orientation of the pegs, the ribs, and/or the posts can be changed. Furthermore, an end stop can include a combination of pegs, ribs, and/or posts.

FIGS. 37-43 illustrate a method of manufacturing an embodiment of a container using a double end stop 2853. Referring to FIG. 37, the double end stop 2853 is shown. The double end stop 2853 includes a first end stop portion 2854 and a second end stop portion 2856 connected together by a first and a second bridge 2911, 2912. The bridges 2911, 2912 are in spaced relation to each other along the Y axis 104 a distance sufficient to accommodate first and second continuous fastening strip ribbons 2879, 2881, as shown in FIG. 42.

Referring to FIG. 37, the double end stop 2853 has a polarity. In other words, the portions 2854, 2856 have a non-regular shape. The portions 2854, 2856 are symmetrically arranged and are positioned to face away from each other along the Y axis 104. The polarity of the portions 2854, 2856 can act to facilitate the assembly of the double end stop 2853 to fastening strip ribbons 2879, 2881, as described herein, by providing a visual and structural reference to indicate a desired orientation of the double end stop 2853. For example, the polarity of the double end stop 2853 can act to indicate the location of a peg of each portion 2854, 2856.

Referring to FIG. 38, the bridges 2911, 2912 are offset from each other along the Z axis 106 such that the entire first bridge 2911 is below the second bridge 2912. As will be discussed below, the offset facilitates the cutting of the bridges 2911, 2912 because only one bridge is cut at one location as opposed to cutting two bridges if the bridges 2911, 2912 were not offset and at the same location in the Z axis.

Referring to FIG. 39, the second end stop portion 2856 and the first end stop portion 2854 of the double end stop 2853 both include a first flange 2922 and a second flange 2924.

Referring to FIG. 40, the first flange 2922 of both the second and the first end stop portions 2856, 2854 includes a shoulder 2926 and a first and a second peg 2928, 2929. The pegs 2928, 2929 are offset from each other over a predetermined distance. The second flange 2924 of both the second and the first end stop portions 2856, 2854 includes a shoulder 2930.

Referring to FIG. 41, the first and second continuous fastening strip ribbons 2879, 2881 are arranged to complementary engage each other. For each double end stop, the first and second continuous fastening strip ribbons 2879, 2881 can be held together at an area 2915 that includes a central portion 2917 flanked by a second portion 2900 and a first portion 2899. In one embodiment, all of the area 2915 is melted together, for example, by ultrasonic sealing or heat sealing. In another embodiment, the portions 2917, 2900, 2899 are separately held together. The central portion 2917 includes a recessed area 2919. The second portion 2900 includes a notch 2940 sized to have a continuous relief portion. The first portion 2899 includes a notch 2949 sized to have a continuous relief portion. As described herein, the continuous relief portions help to prevent the "popping off" of the double end stop 2853 once it has been mounted

to the fastening strip ribbons 2879, 2881, as shown in FIG. 42.

Referring to FIG. 42, the double end stop 2853 is mounted to the fastening strip ribbons 2879, 2881 such that the bridges 2911, 2912 of the double end stop 2853 and the second pegs 2929 of both the first and the second end stop portions 2854, 2856 are aligned with the central recessed area 2919. The first peg 2928 of the second end stop portion 2856 is aligned with the notch 2940 of the second end portion 2900. The first peg 2928 of the first end stop portion 2854 is aligned with the notch 2949 of the first end portion 2899. The first and second pegs 2928, 2929 of both the first and the second end stop portions act to retentively lock the respective end stop portions in place with respect to the fastening strip ribbons 2879, 2881 along the X axis 102. The shoulders 2926, 2930 of both the first and the second end stop portions act to retentively lock the respective end stop portions in place with respect to the fastening strip ribbons 2879, 2881 along the Z axis 106.

Referring to FIG. 43, a second double end stop 2855 is mechanically mounted to a bag assembly 2871. The bag assembly 2871 includes continuous plastic sidewalls 2873 with first and second continuous fastening strip ribbons 2879, 2881 mounted to opposing first and second upper ends 2883, 2885 of the sidewalls 2873. The fastening strip ribbons 2879, 2881 include a plurality of areas 2915. The areas 2915 can be previously made as described above.

A seal wire 2887 has been used to make a first cut 2901 shown by a hidden line 2902 through a first double end stop 2853 and the bag assembly 2871 to define a second and a first end stop 2856, 2854 and a second and a first seam 2877, 2875. The first double end stop 2855 has been mounted to the bag assembly 2871 a predetermined distance from the first seam 2875. The end stops and the bag assembly 2871 have been moved to register the seal wire 2887 with the second double end stop 2855 by moving with

respect to the sealing wire 2887 in an assembly direction 2899 parallel to the X axis 102.

The seal wire 2887 can be passed through the second double end stop 2855 and the bag assembly 2871 to make a
5 second cut 2903 to form a second and first end stop 2856, 2854 and a second and a first seam 2877, 2875. The container 2841 thereafter made includes the first end stop 2854 of the first double end stop 2853, the second end stop 2856 of the second double end stop 2855, the first
10 seam 2875 made by the first cut 2901, the second seam 2877 made by the second cut 2903, and a portion 2909 of the bag assembly 2871 defined by the first and the second cuts 2901, 2903.

The second double end stop 2855 includes a pair of
15 bridges 2911, 2912. The bridges 2911, 2912 separate the pair of end stop portions 2856, 2854 from each other such that once the cutting operation occurs, the end stops are each offset a distance 2905 respectively from the second and first seams 2877, 2875 made by the second cut 2903.

20 A third double end stop 2857 is mounted to the bag assembly 2871 and is placed in predetermined, spaced relation from the second end stop 2855. To form a second container 2843, defined by the second cut 2903 and a hidden line 2904, the third double end stop 2857 and the
25 bag assembly 2871 can be moved with respect to the seal wire 2887 by moving in the assembly direction 2899 and thereafter cut by the seal wire 2887 along the line 2904.

It will be understood that any end stop described herein, or any variation thereof, can be adapted to the
30 double end stop configuration as shown and described in FIGS. 37-43. Furthermore, any end stop described herein, or any variation thereof, can be adapted to be used in the method of manufacturing a container shown and described above.

35 An illustrative example of the type of closure device that can be used with the present invention is shown in FIG. 44. Referring to FIG 44, the exemplary closure

device includes a first fastening strip 3130 with a first closure element 3136 and a second fastening strip 3131 with a second closure element 3134. The first closure element 3136 engages the second closure element 3134. The first fastening strip 3130 may include a flange 3163 disposed at the upper end of the first fastening strip 3130 and a rib 3167 disposed at the lower end of the first fastening strip 3130. The first fastening strip 3130 may also include a flange portion 3169. Likewise, the second fastening strip 3131 may include a flange 3153 disposed at the upper end of the second fastening strip 3131 and a rib 3157 disposed at the lower end of the second fastening strip 3131. The second fastening strip 3131 may also include a flange portion 3159. The side walls 3122, 3123 of the plastic bag 3120 may be attached to the fastening strips 3130, 3131 by conventional manufacturing techniques.

The second closure element 3134 includes a base portion 3138 having a pair of spaced-apart parallel disposed webs 3140, 3141, extending from the base portion 3138. The base and the webs form a U-channel closure element. The webs 3140, 3141 include hook closure portions 3142, 3144 extending from the webs 3140, 3141 respectively, and facing towards each other. The hook closure portions 3142, 3144 include guide surfaces 3146, 3147 which serve to guide the hook closure portions 3142, 3144 for occluding with the hook closure portions 3152, 3154 of the first closure element 3136. The closure element 3134 may include a color enhancement member 3171 which is described in U.S. Patent 4,829,641 and which is incorporated by reference.

The first closure element 3136 includes a base portion 3148 including a pair of spaced-apart, parallel disposed webs 3150, 3151 extending from the base portion 3148. The base and the webs form a U-channel closure element. The webs 3150, 3151 include hook closure portions 3152, 3154 extending from the webs 3150, 3151

respectively and facing away from each other. The hook closure portions 3152, 3154 include guide surfaces 3145, 3155, which generally serve to guide the hook closure portions 3152, 3154 for occlusion with the hook closure portions 3142, 3144 of the second closure element 3134. The guide surfaces 3145, 3155 may also have a rounded crown surface.

The slider 3132 includes a top portion 3172. The top portion provides a separator 3143 having a first end and a second end wherein the first end may be wider than the second end. In addition, the separator 3143 may be triangular in shape. When the slider is moved in the deocclusion direction, the separator 3143 deoccludes the fastening strips 3130, 3131 as shown in FIG. 44. Referring to FIG. 44, the closure elements 3134, 3136 are deoccluded and specifically, the upper hook portions 3142, 3152 and the lower hook portions 3144, 3154 are deoccluded.

The interlocking fastening strips can be "arrowhead-type" or "rib and groove" fastening strips as shown in FIG. 45 and as described in U.S. Patent 3,806,998. The rib element 3305 interlocks with the groove element 3307. The rib element 3305 is of generally arrow-shape in transverse cross section including a head 3310 comprising interlock shoulder hook portions 3311 and 3312 generally convergently related to provide a cam ridge 3313 generally aligned with a stem flange 3314 by which the head is connected in spaced relation with respect to the supporting flange portion 3308. (U.S. Patent 3,806,998, Col. 2, lines 16-23). At their surfaces nearest the connecting stem flange 3314, the shoulder portions 3311 and 3312 define reentrant angles therewith providing interlock hooks engageable with interlock hook flanges 3315 and 3317 respectively of the groove element 3307. (U.S. Patent 3,806,998, Col. 2, lines 23-28). Said hook flanges generally converge toward one another and are spread open to receive the head 3310 therebetween when

said head is pressed into said groove element 3307 until the head is fully received in a groove 3318 of said groove element 3307 generally complementary to the head and within which the head is interlocked by interengagement of the head shoulder hook portions 3311 and 3312 and the groove hook flanges 3315 and 3317. (U.S. Patent 3,806,998, Col. 2, lines 28-36). Through this arrangement, as indicated, the head and groove elements 3305 and 3307 are adapted to be interlockingly engaged by being pressed together and to be separated when forcibly pulled apart, as by means of a generally U-shaped slider 3319. (U.S. Patent 3,806,998, Col. 2, lines 36-41).

The slider 3319 includes a flat back plate 3320 adapted to run along free edges 3321 on the upper ends of the sections of the flange portions 3308 and 3309 as shown in the drawing. (U.S. Patent 3,806,998, Col. 2, lines 41-46). Integrally formed with the back plate 3320 and extending in the same direction (downwardly as shown) therefrom are respective coextensive side walls 3322 with an intermediate spreader finger 3323 extending in the same direction as the side walls at one end of the slider. (U.S. Patent 3,806,998, Col. 2, lines 46-51). The side walls 3322 are in the form of panels which are laterally divergent from a narrower end of the slider. (U.S. Patent 3,806,998, Col. 2, lines 51-55). The slider walls 3322 are each provided with an inwardly projecting shoulder structure 3324 flange adapted to engage respective shoulder ribs 3325 and 3327 on respectively outer sides of the lower section of the flange portions 3308 and 3309. (U.S. Patent 3,806,998, Col. 2, line 66 to Co. 3, line 3).

Additionally, the interlocking fastening strips may comprise "profile" fastening strips, as shown in FIG. 46 and described in U.S. Patent 5,664,299. As shown in FIG. 46, the first profile 3416 has at least an uppermost closure element 3416a and a bottommost closure element 3416b. (U.S. Patent 5,664,299, Col. 3, lines 25-27). The closure elements 3416a and 416b project laterally from the

inner surface of strip 3414. (U.S. Patent 5,664,299, Col. 3, lines 27-28). Likewise, the second profile 3417 has at least an uppermost closure element 3417a and a bottommost closure element 3417b. (U.S. Patent 5,664,299, Col. 3, lines 28-30). The closure elements 3417a and 3417b project laterally from the inner surface of strip 3415. (U.S. Patent 5,664,299, Col. 3, lines 30-32). When the bag is closed, the closure elements of profile 3416 interlock with the corresponding closure elements of profile 3417. (U.S. Patent 5,664,299, Col. 3, lines 32-34). As shown in FIG. 46, closure elements 3416a, 3416b, 3417a, 3417b have hooks on the ends of the closure elements, so that the profiles remain interlocked when the bag is closed, thereby forming a seal. (U.S. Patent 5,664,299, Col. 3, lines 34-37).

The straddling slider 3410 comprises an inverted U-shaped member having a top 3420 for moving along the top edges of the strips 3414 and 3415. (U.S. Patent 5,664,299, Col. 4, lines 1-3). The slider 3410 has sidewalls 3421 and 3422 depending from the top 3420. (U.S. Patent 5,664,299, Col. 4, lines 3-4). A separating leg 3423 depends from the top 3420 between the sidewalls 3421 and 3422 and is located between the uppermost closure elements 3416a and 3417a of profiles 3416 and 3417. (U.S. Patent 5,664,299, Col. 4, lines 26-30). The fastening assembly includes ridges 3425 on the outer surfaces of the fastening strips 3414 and 3415, and shoulders 3421b, 3422b on the side walls of the slider. (U.S. Patent 5,664,299, Col. 4, lines 62-65). The shoulders act as means for maintaining the slider in straddling relation with the fastening strips by grasping the lower surfaces of the ridges 3425. (U.S. Patent 5,664,299, Col. 5, lines 4-7).

Also, the interlocking fastening strips may be "rolling action" fastening strips as shown in FIG. 47 and described in U.S. Patent 5,007,143. The strips 3514 and 3515 include profiled tracks 3518 and 3519 extending along the length thereof parallel to the rib and groove elements

3516 and 3517 and the rib and groove elements 3516, 3517 have complimentary cross-sectional shapes such that they are closed by pressing the bottom of the elements together first and then rolling the elements to a closed position toward the top thereof. (U.S. Patent 5,007,143, Col. 4, line 62 to Col. 5, line 1). The rib element 3516 is hook shaped and projects from the inner face of strip 3514. (U.S. Patent 5,007,143, Col. 5, lines 1-3). The groove element 3517 includes a lower hook-shaped projection 3517a and a relatively straight projection 3517b which extend from the inner face of strip 3515. (U.S. Patent 5,007,143, Col. 5, lines 3-6). The profiled tracks 3518 and 3519 are inclined inwardly toward each other from their respective strips 3514 and 3515. (U.S. Patent 5,007,143, Col. 5, lines 6-8).

The straddling slider 3510 comprises an inverted U-shaped plastic member having a back 3520 for moving along the top edges of the tracks 3518 and 3519 with side walls 3521 and 3522 depending therefrom for cooperating with the tracks and extending from an opening end of the slider to a closing end. (U.S. Patent 5,007,143, Col. 5, lines 26-31). A separator finger 3523 depends from the back 3520 between the side walls 3521 and 3522 and is inserted between the inclined tracks 3518 and 3519. (U.S. Patent 5,007,143, Col. 5, lines 34-36). The slider 3510 has shoulders 3521a, 3522a projecting inwardly from the depending sidewalls 3521, 3522 which are shaped throughout the length thereof for cooperation with the depending separator finger 3523 in creating the rolling action in opening and closing the reclosable interlocking rib and groove profile elements 3516 and 3517. (U.S. Patent 5,007,143, Col. 5, lines 43-49).

Although several interlocking fastening strip embodiments have been specifically described and illustrated herein, it will be readily appreciated by those skilled in the art that other kinds, types, or forms of fastening strips can alternatively be used without

departing from the scope or spirit of the present invention.

The interlocking fastening strips may be manufactured by extrusion through a die and may be formed from any suitable thermoplastic material including, for example, polyethylene, polypropylene, nylon, or the like, or from a combination thereof. Thus, resins or mixtures of resins such as high-density polyethylene, medium density polyethylene, and low-density polyethylene may be employed to prepare the interlocking fastening strips.

When the fastening strips are used in a sealable bag, the fastening strips and the films that form the body of the bag may be conveniently manufactured from heat sealable material. In this way, the bag may be economically formed by using an aforementioned thermoplastic material and by heat sealing the fastening strips to the bag. For example, the bag may be made from a mixture of high pressure, low-density polyethylene and linear, low-density polyethylene.

The fastening strips may be manufactured by extrusion or other known methods. For example, the closure device may be manufactured as individual fastening strips for later attachment to the bag or may be manufactured integrally with the bag. In addition, the fastening strips may be manufactured with or without flange portions on one or both of the fastening strips depending upon the intended use of the fastening strips or expected additional manufacturing operations. The slits may be cut during the manufacturing of the fastening strips using rollers which contain an appropriately placed knife edge.

Generally, the fastening strips can be manufactured in a variety of forms to suit the intended use. The fastening strips may be integrally formed on the opposing sidewalls of the container or bag, or connected to the container by the use of any of many known methods. For example, a thermoelectric device may be applied to a film in contact with the flange portion of the fastening strips

or the thermoelectric device may be applied to a film in contact with the base portion of fastening strips having no flange portion, to cause a transfer of heat through the film to produce melting at the interface of the film and a flange portion or base portion of the fastening strips. Suitable thermoelectric devices include heated rotary discs, traveling heater bands, resistance-heated slide wires, and the like. The connection between the film and the fastening strips may also be established by the use of hot melt adhesives, hot jets of air to the interface, ultrasonic heating, or other known methods. The bonding of the fastening strips to the film stock may be carried out either before or after the film is U-folded to form the bag. In any event, such bonding may be done prior to side sealing the bag at the edges by conventional thermal cutting. In addition, the first and second fastening strips may be positioned on opposite sides of the film. Such an embodiment would be suited for wrapping an object or a collection of objects such as wires. The first and second fastening strips should usually be positioned on the film in a generally parallel relationship with respect to each other, although this will depend on the intended use.

The slider may be multiple parts and snapped together. In addition, the slider may be made from multiple parts and fused or welded together. The slider may also be a one-piece construction. The slider can be colored, opaque, translucent or transparent. The slider may be injection molded or made by any other method. The slider may be molded from any suitable plastic material, such as, nylon, polypropylene, polystyrene, acetal, toughened acetal, polyketone, polybutylene terephthalate, high density polyethylene, polycarbonate or ABS (acrylonitrile-butadiene-styrene).

From the foregoing it will be understood that modifications and variations may be effectuated to the disclosed structures - particularly in light of the

foregoing teachings - without departing from the scope or spirit of the present invention. As such, no limitation with respect to the specific embodiments described and illustrated herein is intended or should be inferred. In
5 addition, all references and copending applications cited herein are hereby incorporated by reference in their entireties.

WHAT IS CLAIMED IS:

1. A closure device comprising:
 - a first fastening strip;
 - 5 a second fastening strip, the first and the second fastening strips being adapted to interlock with each other over a predetermined length between first and second ends thereof; and
 - an end stop mounted to the first and the second
 - 10 fastening strips, the end stop including a body portion and a flange, the flange depending from the body portion, and a shoulder projecting from the flange, the shoulder retentively arranged with one of the fastening strips.
- 15 2. The closure device as in claim 1 wherein the first end stop further comprises a second flange, the second flange depending from the body portion, and a shoulder projecting from the second flange, the shoulder of the second flange retentively arranged with the other
- 20 one of the fastening strips.
3. The closure device as in claim 2 wherein a second shoulder projects from the first flange, the second shoulder of the first flange retentively arranged
- 25 with the one of the fastening strips, and a second shoulder projects from the second flange, the second shoulder of the second flange retentively arranged with the other one of the fastening strips.
- 30 4. The closure device as in claim 1 further comprising:
 - a second end stop mounted to the first and the
 - second fastening strips, the second end stop including a
 - body portion and a flange, the flange depending from the
 - 35 body portion, and a shoulder projecting from the flange, the shoulder retentively arranged with one of the fastening strips.

5. The closure device as in claim 4 wherein the second end stop further comprises a second flange, the second flange depending from the body portion, and a shoulder projecting from the second flange, the shoulder of the second flange retentively arranged with the other one of the fastening strips.

6. The closure device as in claim 1 further comprising a slider adapted to be slidably disposed on the fastening strips and facilitating the occlusion of the fastening strips when moved towards the first end thereof and facilitating the deocclusion of the fastening strips when moved towards the second end thereof.

7. The closure device as in claim 1 wherein the first and the second fastening strips comprise U-channel type fastening strips.

8. The closure device as in claim 1 wherein the fastening strips comprise arrowhead type fastening strips.

9. The closure device as in claim 1 wherein the fastening strips comprise profile type fastening strips.

10. The closure device as in claim 1 wherein the fastening strips comprise rolling action type fastening strips.

11. A closure device comprising:
- a first fastening strip;
 - a second fastening strip, the first and the second fastening strips being adapted to interlock with each other over a predetermined length between first and second ends thereof, the first and the second fastening strips having a longitudinal X axis and a transverse Y axis, the transverse Y axis being perpendicular to the longitudinal X axis, the first and the second fastening strips having a vertical Z axis, the vertical Z axis being perpendicular to the longitudinal X axis, the vertical Z axis being perpendicular to the transverse Y axis; and
 - an end stop mounted to the first and the second fastening strips, the end stop including a body portion and a flange, the flange depending from the body portion, a protrusion projecting from the flange, the protrusion retentively arranged with one of the fastening strips to hold the end stop relative to the fastening strips along the X axis.
12. The closure device as in claim 11 wherein the end stop further comprises a shoulder projecting from the flange; the shoulder retentively arranged with the one of the fastening strips.
13. The closure device as in claim 12 wherein the end stop further comprises a second flange, the second flange depending from the body portion, and a shoulder projecting from the second flange, the shoulder of the second flange retentively arranged with the other one of the fastening strips.

14. The closure device as in claim 11 wherein the end stop further comprises a second flange, the second flange depending from the body portion, a protrusion projecting from the second flange, the protrusion of the second flange retentively arranged with the other one of the fastening strips to hold the end stop relative to the fastening strips along the X axis.

15. The closure device as in claim 14 wherein the first flange includes a second protrusion, and the second flange includes a second protrusion.

16. The closure device as in claim 15 wherein the protrusions of the first flange oppose the protrusions of the second flange.

17. The closure device as in claim 15 wherein the first flange includes a third protrusion.

18. The closure device as in claim 17 wherein the protrusions of the second flange are interdigitated between the protrusions of the second flange.

19. The closure device as in claim 17 wherein the second flange includes a third protrusion.

20. The closure device as in claim 19 wherein the protrusions of the first flange oppose the protrusions of the second flange.

21. The closure device as in claim 11 wherein the first and the second fastening strips include a first end portion, the first end portion having a notch, and wherein the protrusion is a peg, the peg disposed within the notch of the first end portion.

22. The closure device as in claim 21 wherein the first end portion secures the first and the second fastening strips together.

5 23. The closure device as in claim 22 wherein the first end portion is a melted portion.

24. The closure device as in claim 22 wherein the first end portion includes a relief portion.

10 25. The closure device as in claim 24 wherein the relief portion is continuous with the notch.

26. The closure device as in claim 11 wherein the protrusion is a post disposed at a desired location along the Z axis between the body portion and a free end of the flange.

27. The closure device as in claim 11 wherein the protrusion is a rib.

28. The closure device as in claim 27 wherein the rib extends along the Z axis.

25 29. The closure device as in claim 27 wherein the rib includes a point, the point of the rib configured to contact one of the fastening strips to hold the end stop relative to the fastening strips along the X axis and along the Z axis.

30 30. The closure device as in claim 29 wherein the rib further includes a ramped portion and a retaining surface that define the point.

35 31. The closure device as in claim 11 wherein the protrusion has an edge, the edge contacting one of the fastening strips.

32. The closure device as in claim 11 wherein the protrusion has a beveled surface.

33. The closure device as in claim 11 wherein the
5 protrusion has a planar end.

34. The closure device as in claim 18 wherein each of the protrusions has a beveled surface.

10 35. The closure device as in claim 19 wherein each of the protrusion has a beveled surface.

36. The closure device as in claim 20 wherein each of the protrusion has a beveled surface, and wherein the
15 beveled surfaces of the protrusions projecting from the first flange oppose the beveled surfaces of the protrusions projecting from the second flange.

37. The closure device as in claim 20 wherein each
20 of the protrusion has a beveled surface, and wherein the beveled surfaces of the protrusions projecting from the first flange are complementary to the beveled surfaces of the protrusions projecting from the second flange.

25 38. The closure device as in claim 11 further comprising:

a second end stop mounted to the first and the second fastening strips, the second end stop including a body portion and a flange, the flange depending from the
30 body portion, a protrusion projecting from the flange, the protrusion retentively arranged with one of the fastening strips to hold the end stop relative to the fastening strips along the X axis.

39. The closure device as in claim 38 wherein the first and the second fastening strips include a second end portion securing the first and the second fastening strips together, the second end portion having a notch, and wherein the protrusion of the second end stop is a peg, the peg of the second end stop disposed in the notch of the second end portion.

40. The closure device as in claim 11 further comprising a slider adapted to be slidably disposed on the fastening strips and facilitating the occlusion of the fastening strips when moved towards the first end thereof and facilitating the deocclusion of the fastening strips when moved towards the second end thereof.

41. The closure device as in claim 11 wherein the first and the second fastening strips comprise U-channel type fastening strips.

42. The closure device as in claim 11 wherein the fastening strips comprise arrowhead type fastening strips.

43. The closure device as in claim 11 wherein the fastening strips comprise profile type fastening strips.

44. The closure device as in claim 11 wherein the fastening strips comprise rolling action type fastening strips.

45. A closure device comprising:
a first fastening strip;
a second fastening strip, the first and the second
fastening strips being adapted to interlock with each
5 other over a predetermined length between first and
second ends thereof; and
an end stop mounted to the first and the second
fastening strips, the end stop including a body portion
and a flange, the flange depending from the body portion,
10 and a retaining portion having a retainer and a shoulder,
the retaining portion pivotally mounted to the body
portion and moveable to a closed position wherein the
retainer is retentively arranged with the catch and the
shoulder is retentively arranged with one of the
15 fastening strips.

46. The closure device as in claim 45 wherein the
end stop has a longitudinal X axis and a transverse Y
axis, the transverse Y axis being perpendicular to the
20 longitudinal X axis, the first and the second fastening
strips having a vertical Z axis, the vertical Z axis
being perpendicular to the longitudinal X axis, the
vertical Z axis being perpendicular to the transverse Y
axis, and wherein the end stop further includes a
25 protrusion projecting from the flange, the protrusion
retentively arranged with one of the fastening strips to
hold the end stop relative to the fastening strips along
the X axis.

47. The closure device as in claim 46 wherein the
30 first and the second fastening strips include a first end
portion, the first end portion having a notch, and herein
the protrusion of the end stop is a peg, the peg disposed
within the notch of the first end portion.

48. The closure device as in claim 45 wherein the
35 retaining portion is generally U-shaped.

49. The closure device as in claim 45 wherein the retaining portion includes a pair of legs, each leg having an end, the ends being pivotally attached to the body portion by a respective pair of living hinges.

5

50. The closure device as in claim 45 wherein the retainer of the retaining portion comprises a barb, a resiliently flexible wall portion, and a recessed channel.

10

51. The closure device as in claim 45 further comprising:

a second end stop mounted to the first and the second fastening strips, the second end stop including a body portion and a flange, the flange depending from the body portion, and a retaining portion having a retainer and a shoulder, the retaining portion pivotally mounted to the body portion and moveable to a closed position wherein the retainer is retentively arranged with the catch and the shoulder is retentively arranged with one of the fastening strips.

15

20

52. The closure device as in claim 45 further comprising a slider adapted to be slidably disposed on the fastening strips and facilitating the occlusion of the fastening strips when moved towards the first end thereof and facilitating the deocclusion of the fastening strips when moved towards the second end thereof.

30

53. The closure device as in claim 45 wherein the first and the second fastening strips comprise U-channel type fastening strips.

54. The closure device as in claim 45 wherein the fastening strips comprise arrowhead type fastening strips.

5 55. The closure device as in claim 45 wherein the fastening strips comprise profile type fastening strips.

56. The closure device as in claim 45 wherein the fastening strips comprise rolling action type fastening
10 strips.

57. An end stop comprising:
a body portion; and
a flange depending from the body portion, the first
15 flange having a shoulder projecting therefrom.

58. The end stop as in claim 57 wherein the first flange further comprises a second shoulder projecting therefrom, and further comprising a second flange, the
20 second flange depending from the body portion, a pair of shoulders projecting from the second flange.

59. An end stop comprising:
a body portion; and
25 a flange depending from the body portion, a protrusion projecting from the first flange.

60. The end stop as in claim 59 wherein the protrusion is a peg.

61. The end stop as in claim 59 wherein the end stop has a longitudinal X axis and a transverse Y axis, the transverse Y axis being perpendicular to the longitudinal X axis, the first and the second fastening strips having a vertical Z axis, the vertical Z axis being perpendicular to the longitudinal X axis, the vertical Z axis being perpendicular to the transverse Y axis; and wherein the protrusion is a post, the post disposed at a desired location along the Z axis between the body portion and a free end of the flange.

62. The end stop as in claim 59 wherein the protrusion is a rib.

63. An end stop comprising:
a body portion;
a flange depending from the body portion, the first flange having a catch; and
a retaining portion having a retainer and a shoulder, the retaining portion pivotally mounted to the body portion and moveable to a closed position wherein the retainer is retentively arranged with the catch and the shoulder is disposed adjacent an end of the first flange.

64. A container comprising:

- a first sidewall and a second sidewall, the first sidewall includes a first fastening strip, the second sidewall includes a second fastening strip, the first and the second fastening strips being adapted to interlock with each other over a predetermined length between first and second ends thereof, the first and the second fastening strips including a first end portion, the first end portion having a notch; and
- an end stop mounted to the first and the second fastening strips, the end stop including a body portion and a flange, the flange depending from the body portion, and a shoulder projecting from the flange, the shoulder retentively arranged with one of the fastening strips.

15

65. A container, the container having a longitudinal X axis and a transverse Y axis, the transverse Y axis being perpendicular to the longitudinal X axis, the container having a vertical Z axis, the vertical Z axis being perpendicular to the longitudinal X axis, the vertical Z axis being perpendicular to the transverse Y axis, the container comprising:

- a first sidewall and a second sidewall, the first sidewall includes a first fastening strip, the second sidewall includes a second fastening strip, the first and the second fastening strips being adapted to interlock with each other over a predetermined length between first and second ends thereof; and
- an end stop mounted to the first and the second fastening strips, the end stop including a body portion and a flange, the flange depending from the body portion, a protrusion projecting from the flange, the protrusion retentively arranged with one of the fastening strips to hold the end stop relative to the fastening strips along the X axis.

35

66. A container comprising:

5 a first sidewall and a second sidewall, the first sidewall includes a first fastening strip, the second sidewall includes a second fastening strip, the first and the second fastening strips being adapted to interlock with each other over a predetermined length between first and second ends thereof; and

10 an end stop mounted to the first and the second fastening strips, the end stop including a body portion and a flange, the flange depending from the body portion, and a retaining portion having a retainer and a shoulder, the retaining portion pivotally mounted to the body portion and moveable to a closed position wherein the retainer is retentively arranged with the catch and the
15 shoulder is retentively arranged with one of the fastening strips.

67. A method of manufacturing a container comprising:

20 providing a first sidewall and a second sidewall, the first sidewall includes a first fastening strip, the second sidewall includes a second fastening strip, the first and the second fastening strips being adapted to interlock with each other over a predetermined length
25 between first and second ends thereof, the first and the second fastening strips having a longitudinal X axis and a transverse Y axis, the transverse Y axis being perpendicular to the longitudinal X axis, the first and the second fastening strips having a vertical Z axis, the
30 vertical Z axis being perpendicular to the longitudinal X axis, the vertical Z axis being perpendicular to the transverse Y axis, the first and the second fastening strips including a first end portion, the first end portion having a notch;

35 providing an end stop, the end stop including a body portion and a flange, the flange depending from the body portion, and a shoulder projecting from the flange; and

mounting the end stop to the first and the second fastening strips by positioning the end stop such that the shoulder is retentively arranged with one of the fastening strips.

5

68. A method of manufacturing a container comprising:

providing a first sidewall and a second sidewall, the first sidewall includes a first fastening strip, the
10 second sidewall includes a second fastening strip, the first and the second fastening strips being adapted to interlock with each other over a predetermined length between first and second ends thereof, the first and the second fastening strips having a longitudinal X axis and
15 a transverse Y axis, the transverse Y axis being perpendicular to the longitudinal X axis, the first and the second fastening strips having a vertical Z axis, the vertical Z axis being perpendicular to the longitudinal X axis, the vertical Z axis being perpendicular to the
20 transverse Y axis;

providing an end stop, the end stop including a body portion and a flange, the flange depending from the body portion, a protrusion projecting from the flange; and

mounting the end stop to the first and the second
25 fastening strips such that the protrusion of the end stop is retentively arranged with one of the fastening strips to hold the end stop relative to the fastening strips along the X axis.

69. A method of manufacturing a container comprising:

providing a first sidewall and a second sidewall, the first sidewall includes a first fastening strip, the
5 second sidewall includes a second fastening strip, the first and the second fastening strips being adapted to interlock with each other over a predetermined length between first and second ends thereof, the first and the second fastening strips having a longitudinal X axis and
10 a transverse Y axis, the transverse Y axis being perpendicular to the longitudinal X axis, the first and the second fastening strips having a vertical Z axis, the vertical Z axis being perpendicular to the longitudinal X axis, the vertical Z axis being perpendicular to the
15 transverse Y axis, the first and the second fastening strips including a first end portion, the first end portion having a notch;

providing an end stop, the end stop including a body portion and a flange, the flange depending from the body
20 portion, and a retaining portion having a retainer and a shoulder, the retaining portion pivotally mounted to the body portion and moveable to a closed position wherein the retainer is retentively arranged with the catch;

mounting the end stop to the first and the second
25 fastening strips; and

moving the retaining portion to the closed position wherein the shoulder is retentively arranged with one of the fastening strips.

70. A method of manufacturing a container comprising:

providing a bag assembly, the bag assembly including continuous plastic sidewalls with first and second
5 continuous fastening strip ribbons mounted to opposing first and second upper ends of the sidewalls, the first and the second fastening strip ribbons including a plurality of areas, each area having a central portion flanked by a second portion and a first
10 portion;

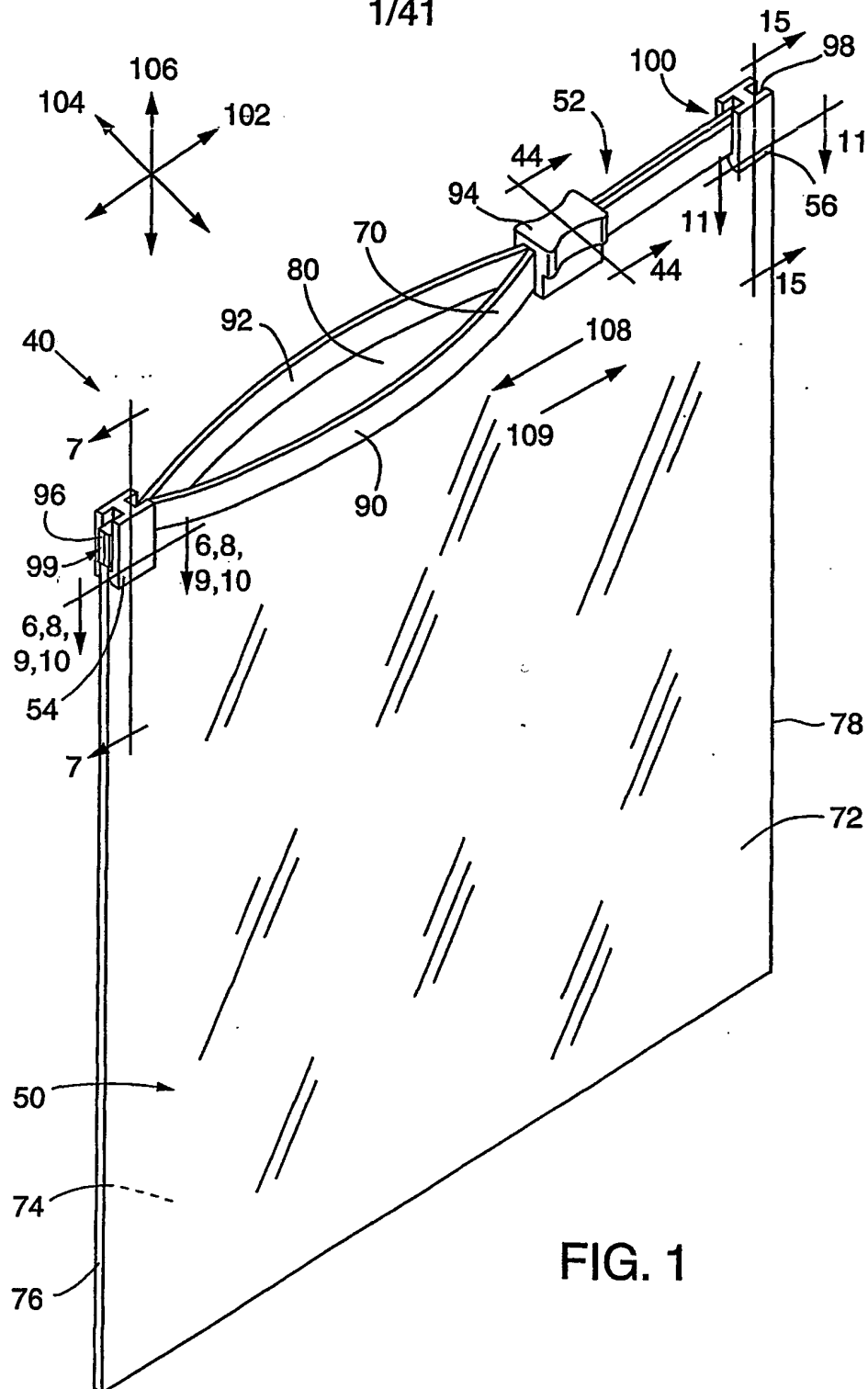
providing a double end stop, the double end stop including a first end stop portion and a second end stop portion, a bridge attached to the first end stop portion and the second end stop portion;

15 mounting the double end stop to the first and the second fastening strip ribbons such that the second end stop portion is aligned with the second portion and the central portion of one of the areas of the fastening strip ribbons and such that the first end stop portion is
20 aligned with the first portion and the central portion of the one of the areas of the fastening strip ribbons;

making a first cut through the bridge of the double end stop and the bag assembly to define a first seam; and

making a second cut a predetermined distance from
25 the first cut through the bag assembly to define a second seam.

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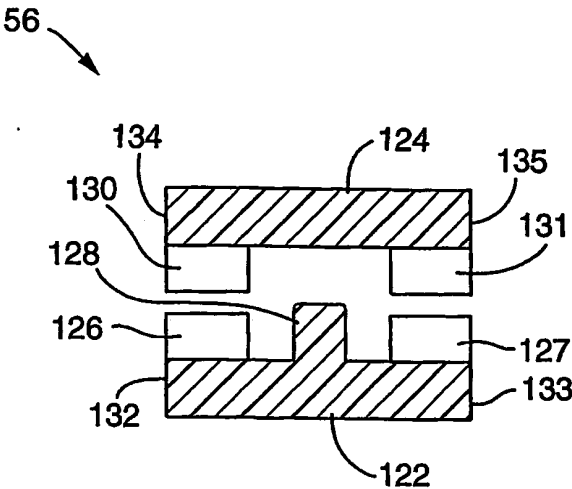


FIG. 3

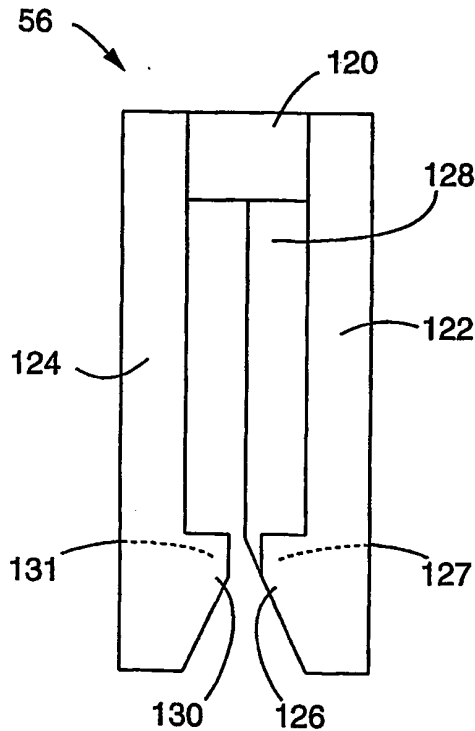


FIG. 4

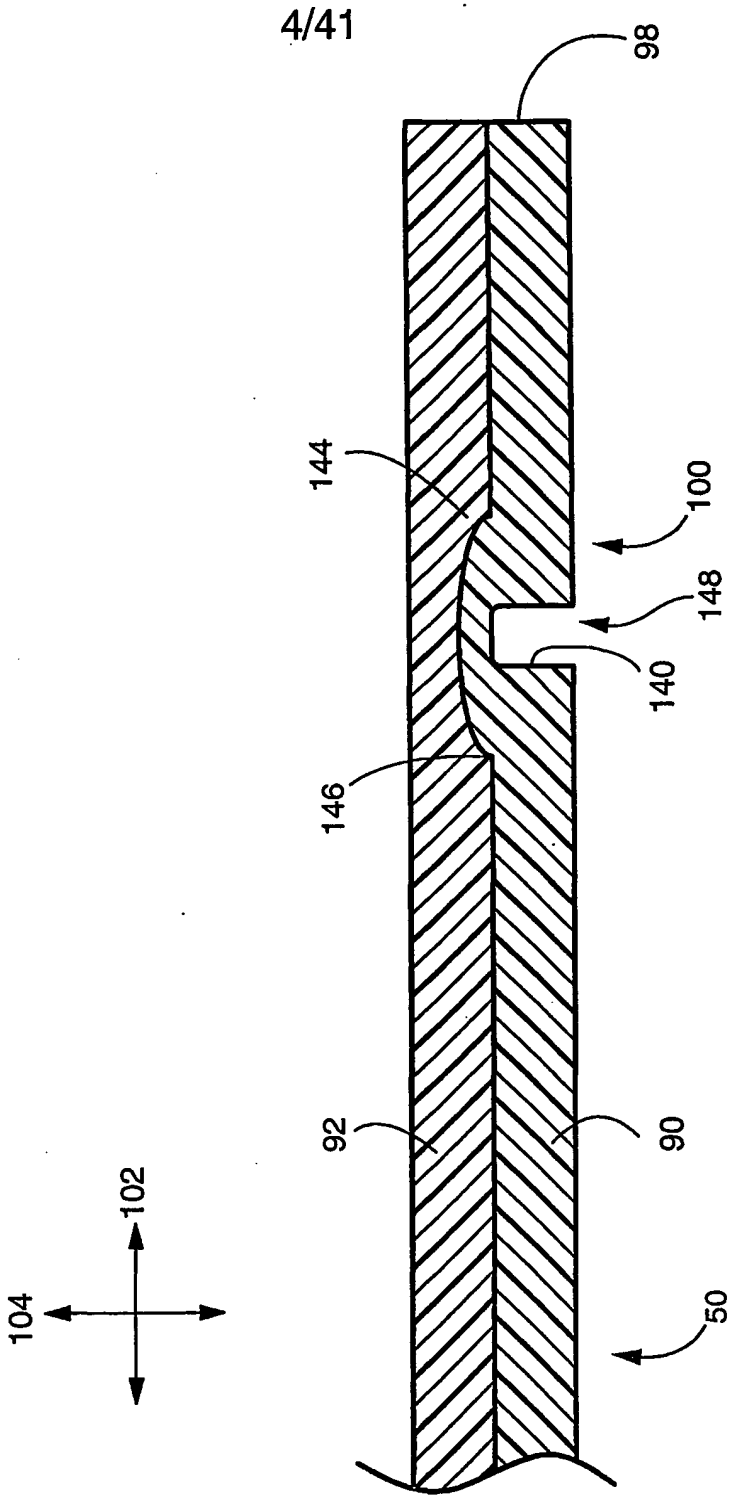


FIG. 5

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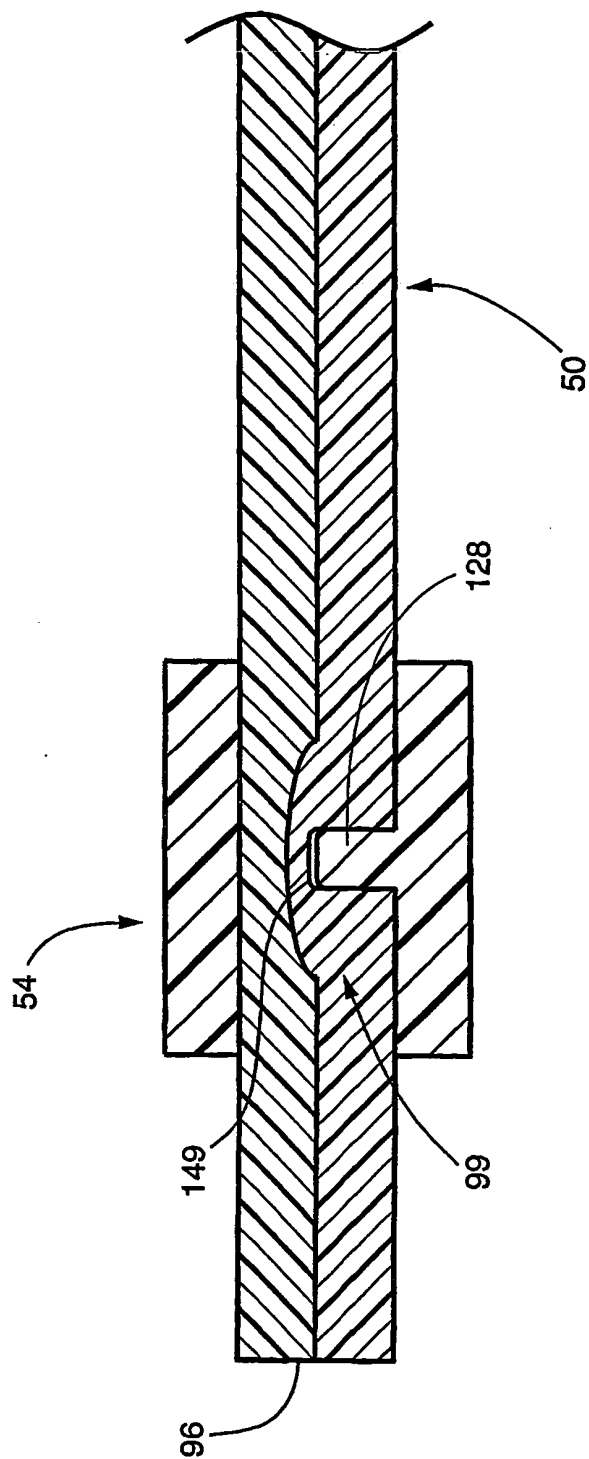
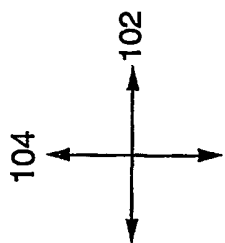


FIG. 6

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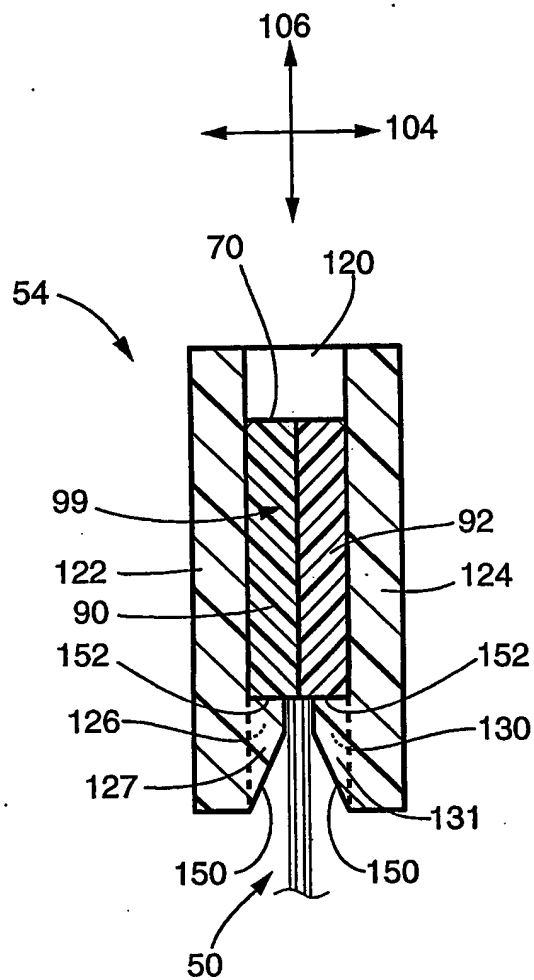


FIG. 7

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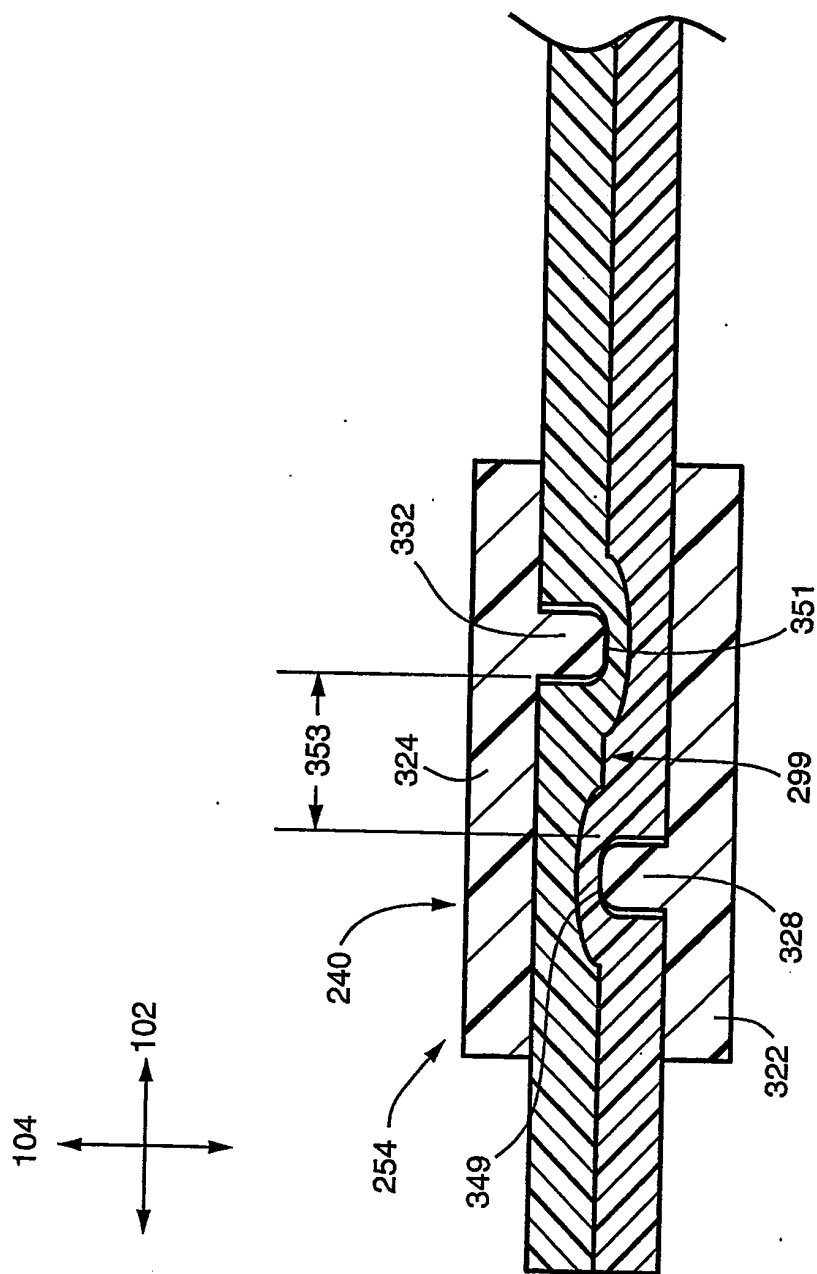


FIG. 8

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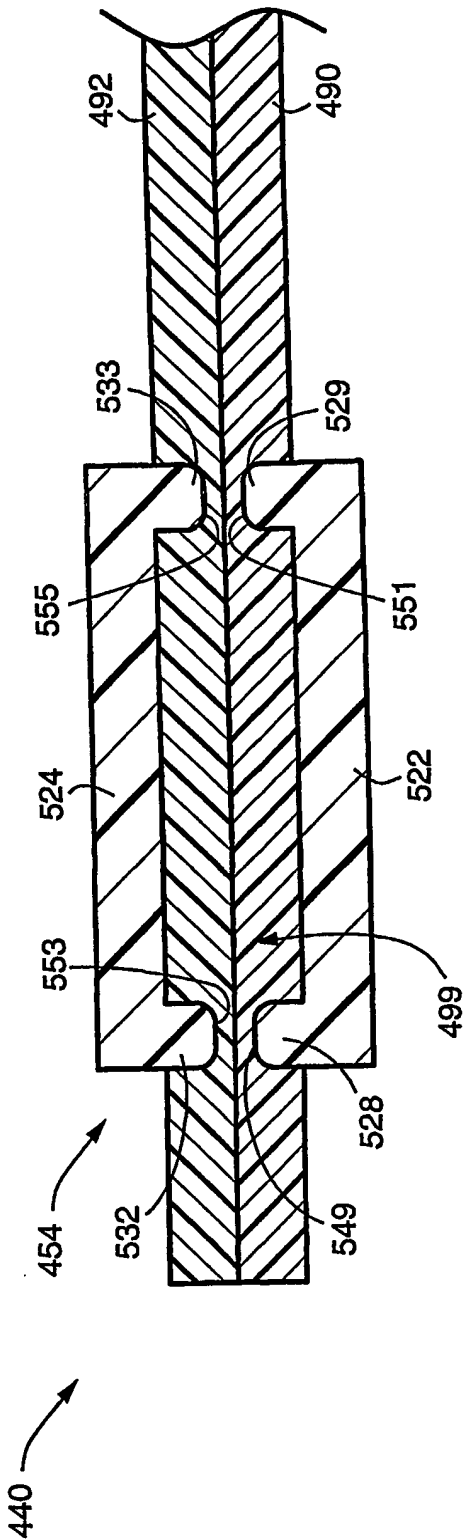
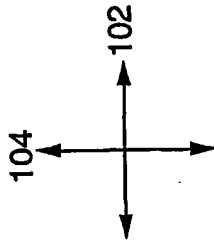


FIG. 9

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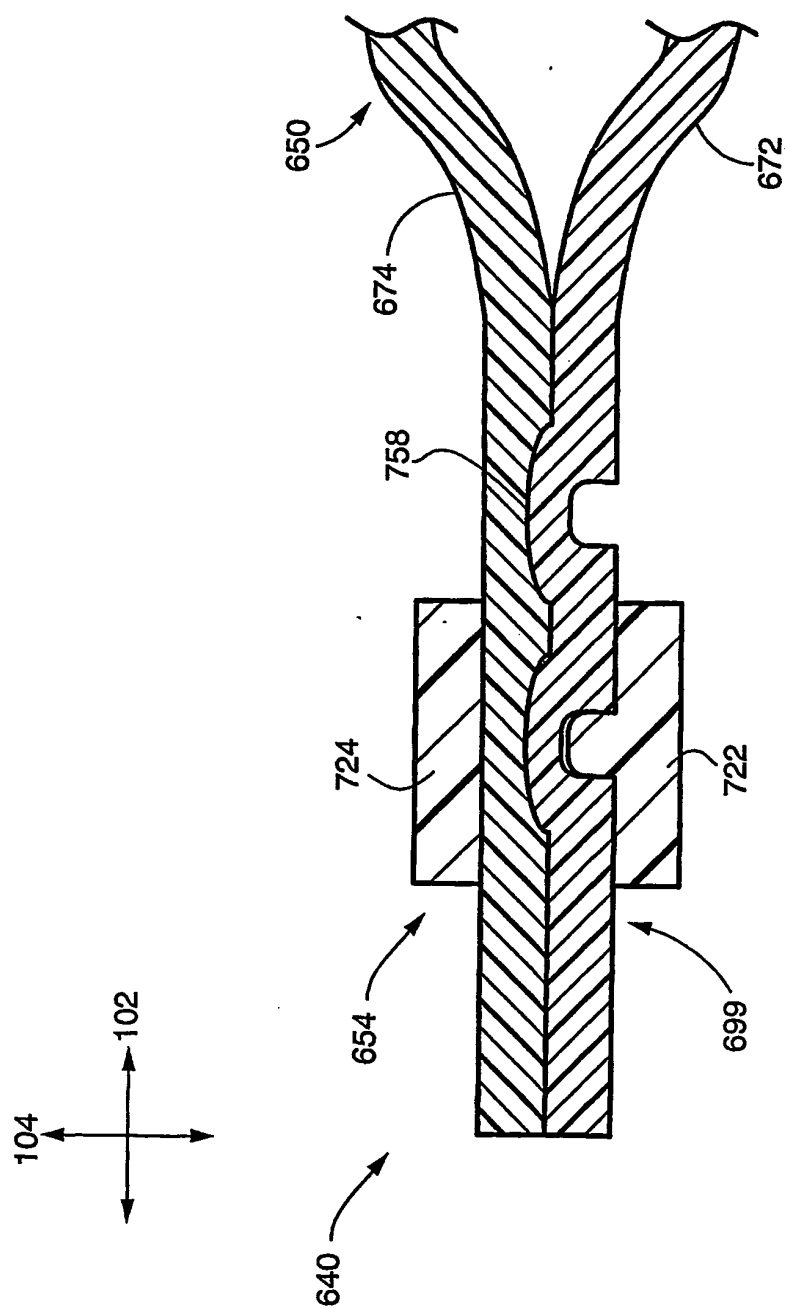


FIG. 10

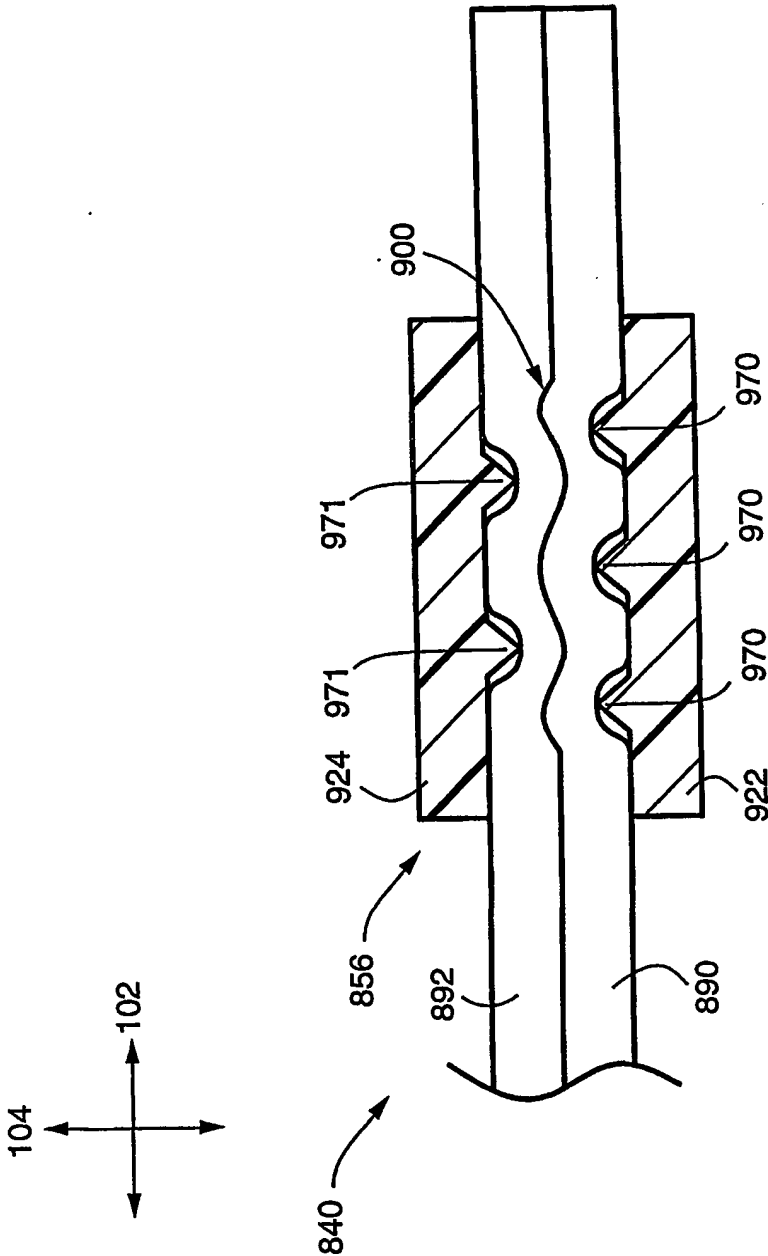


FIG. 11

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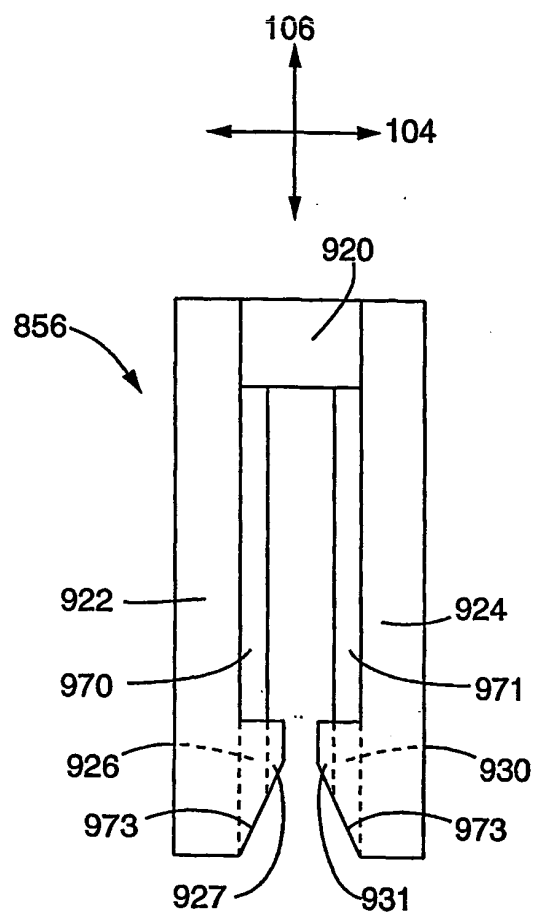


FIG. 12

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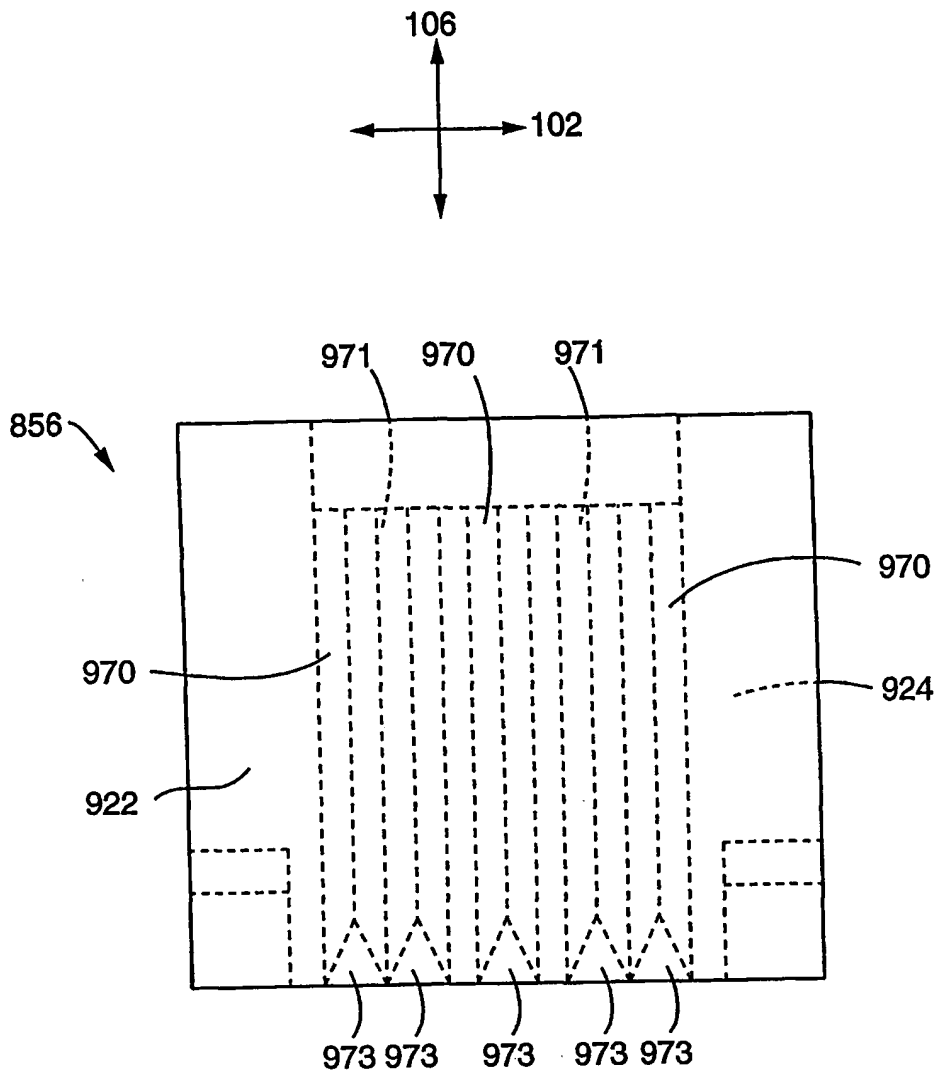


FIG. 13

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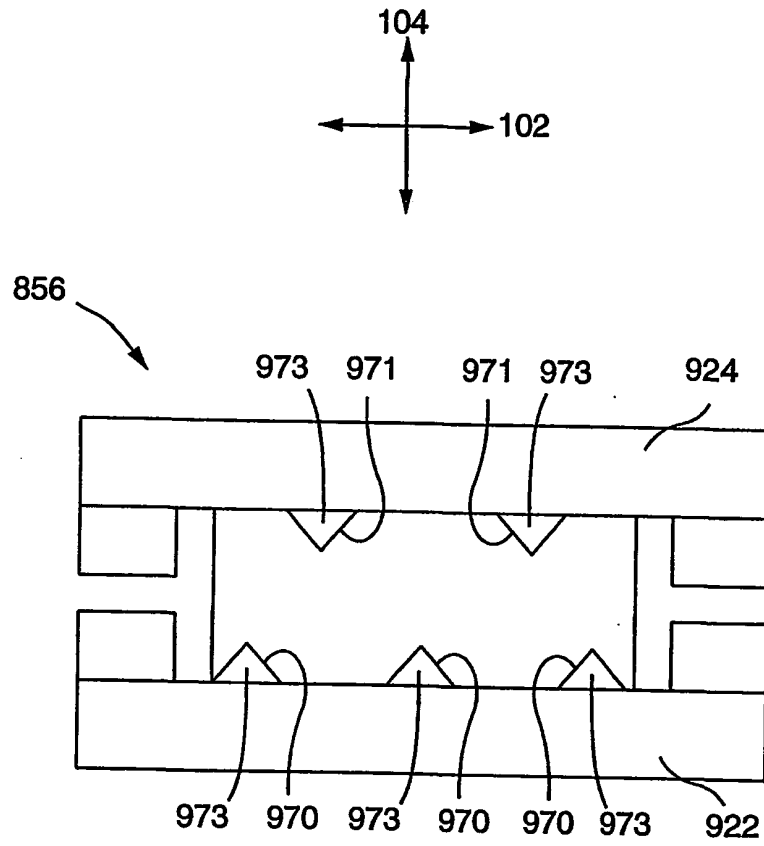


FIG. 14

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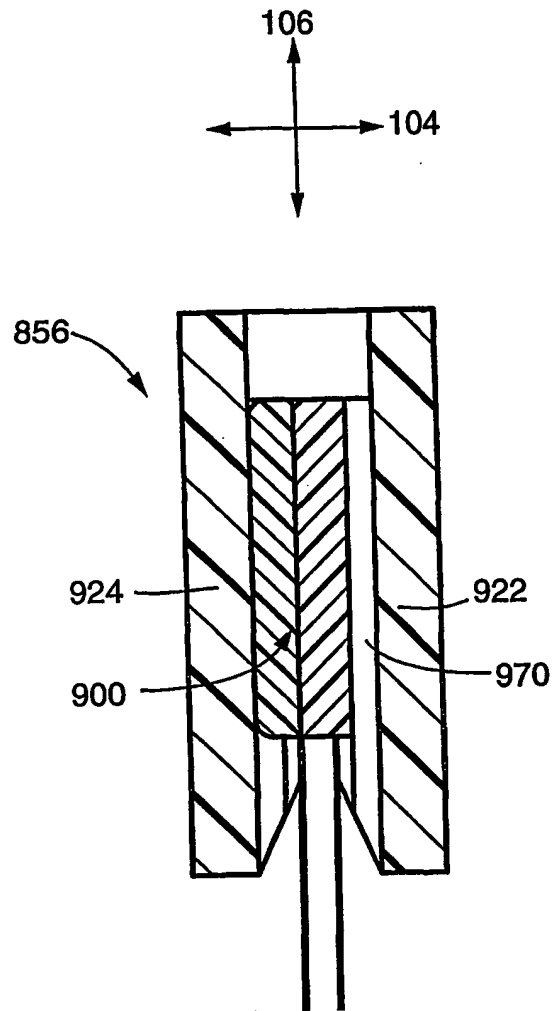


FIG. 15

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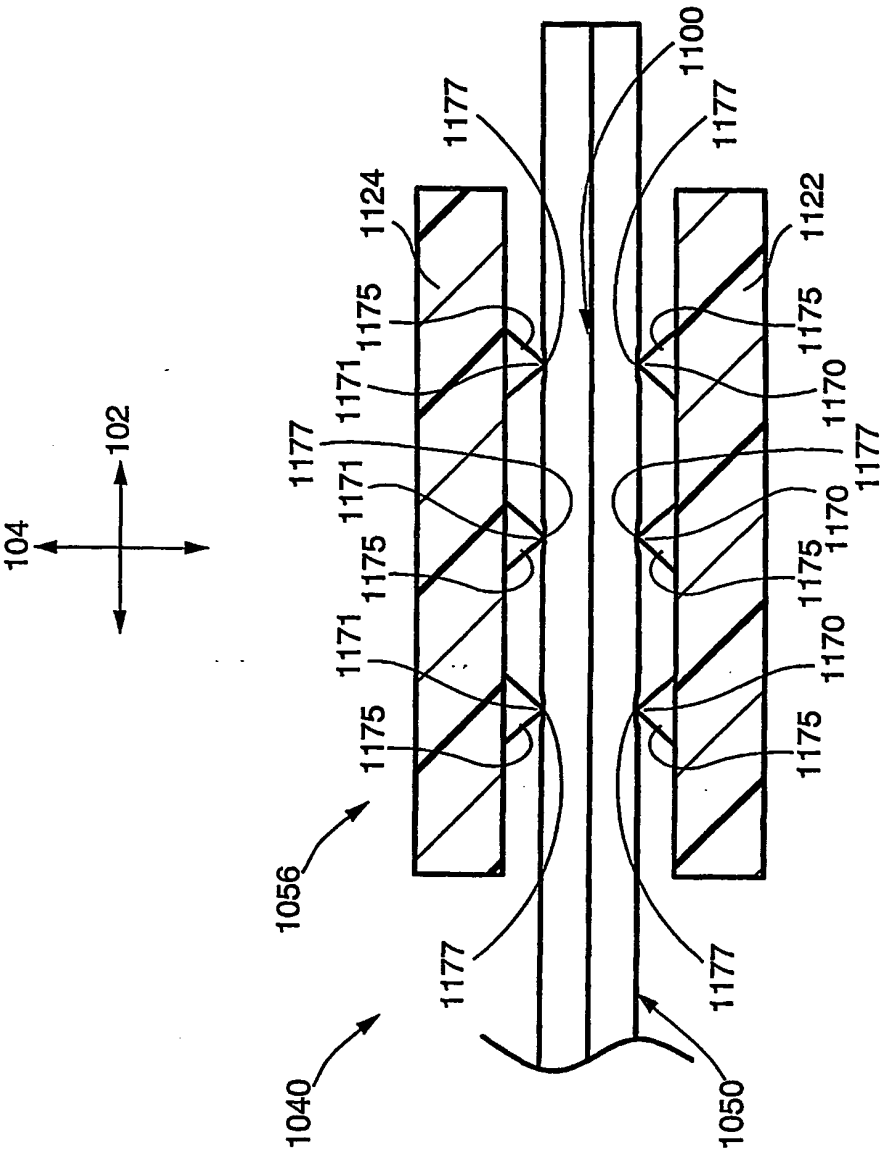


FIG. 16

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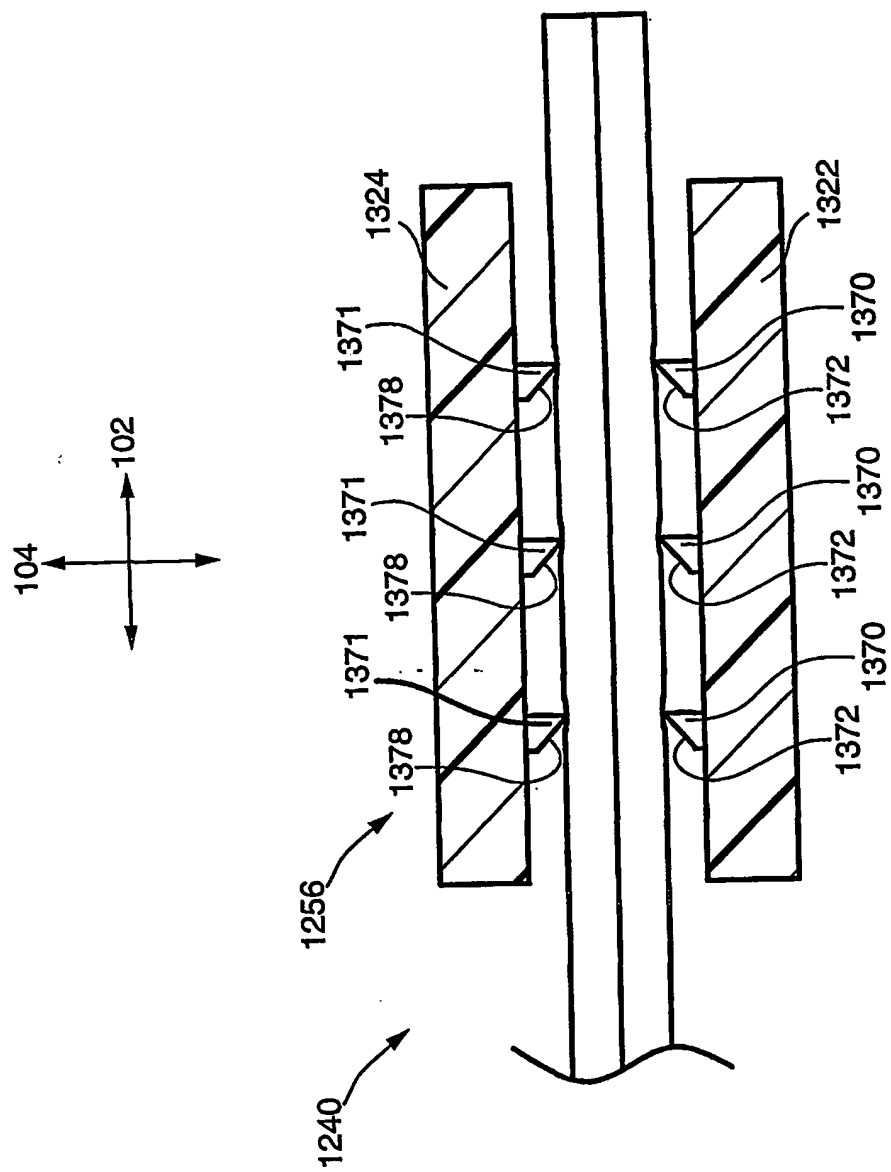


FIG. 17

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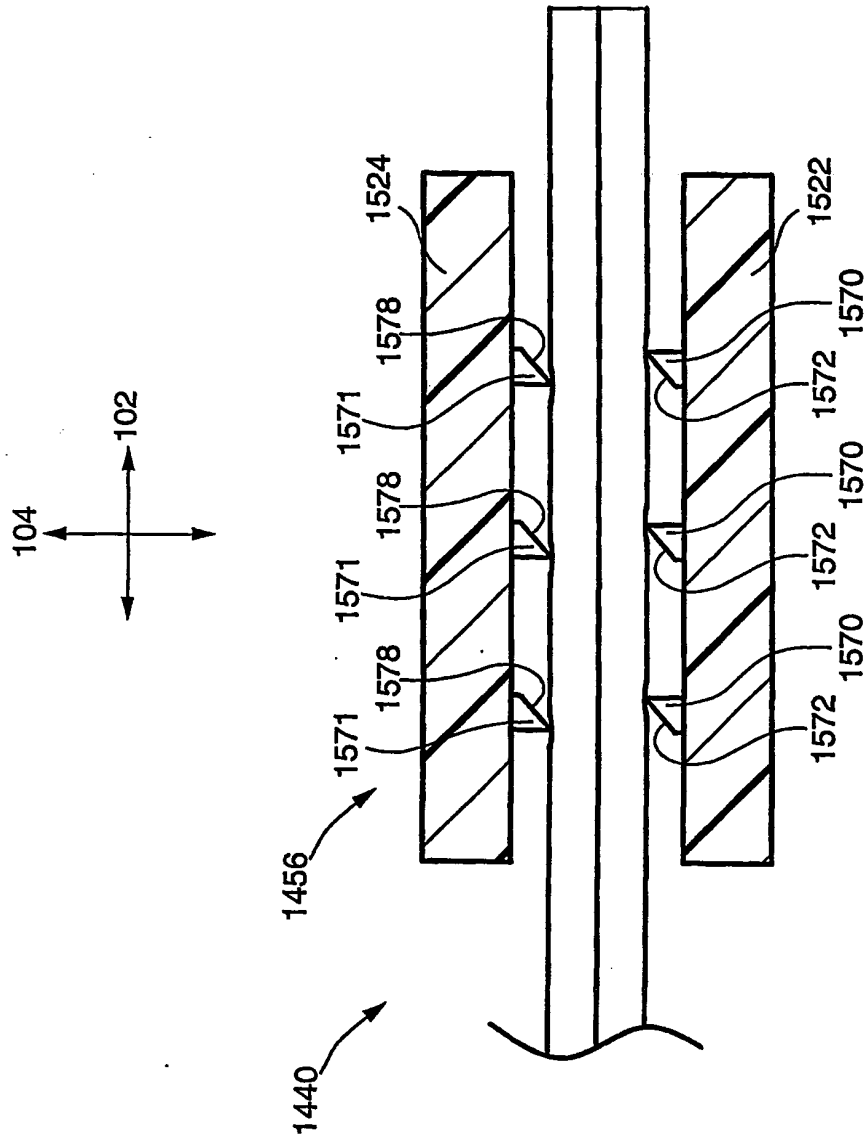


FIG. 18

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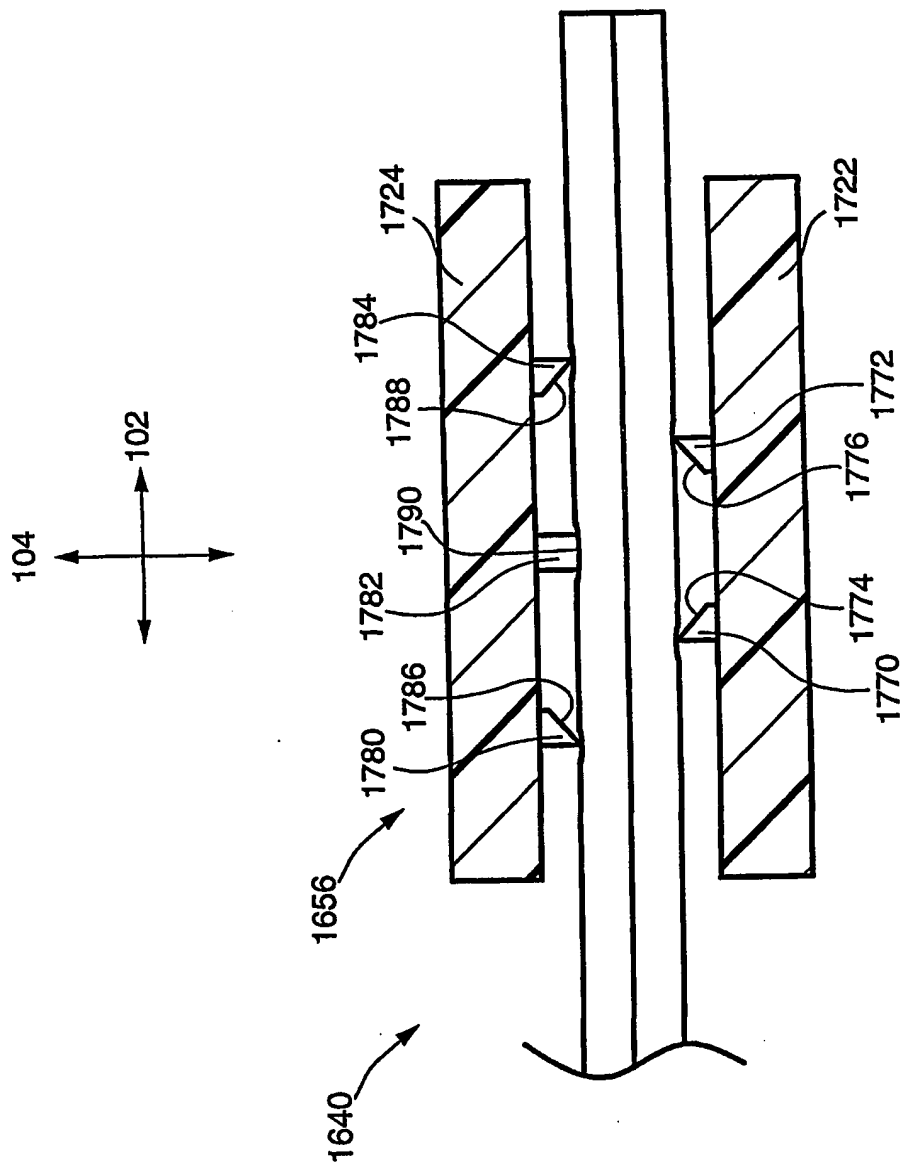


FIG. 19

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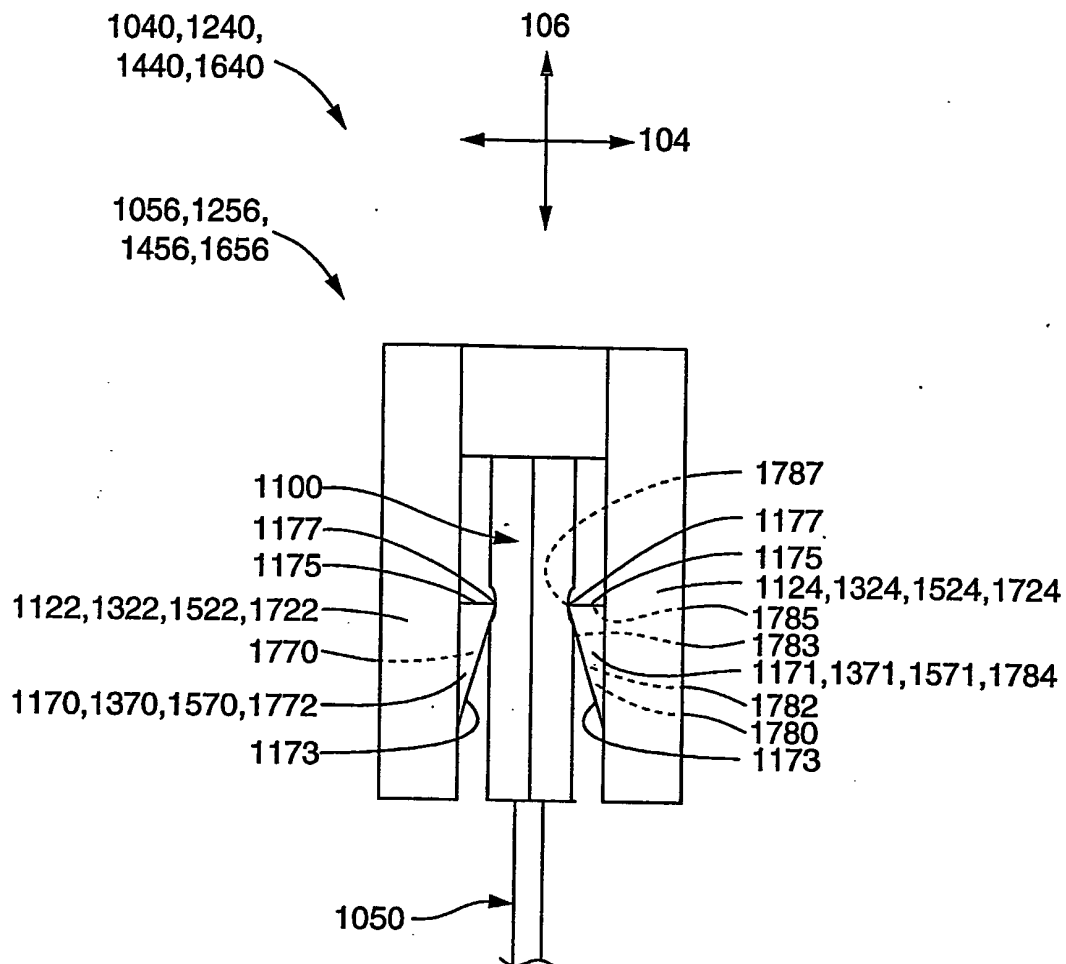


FIG. 20

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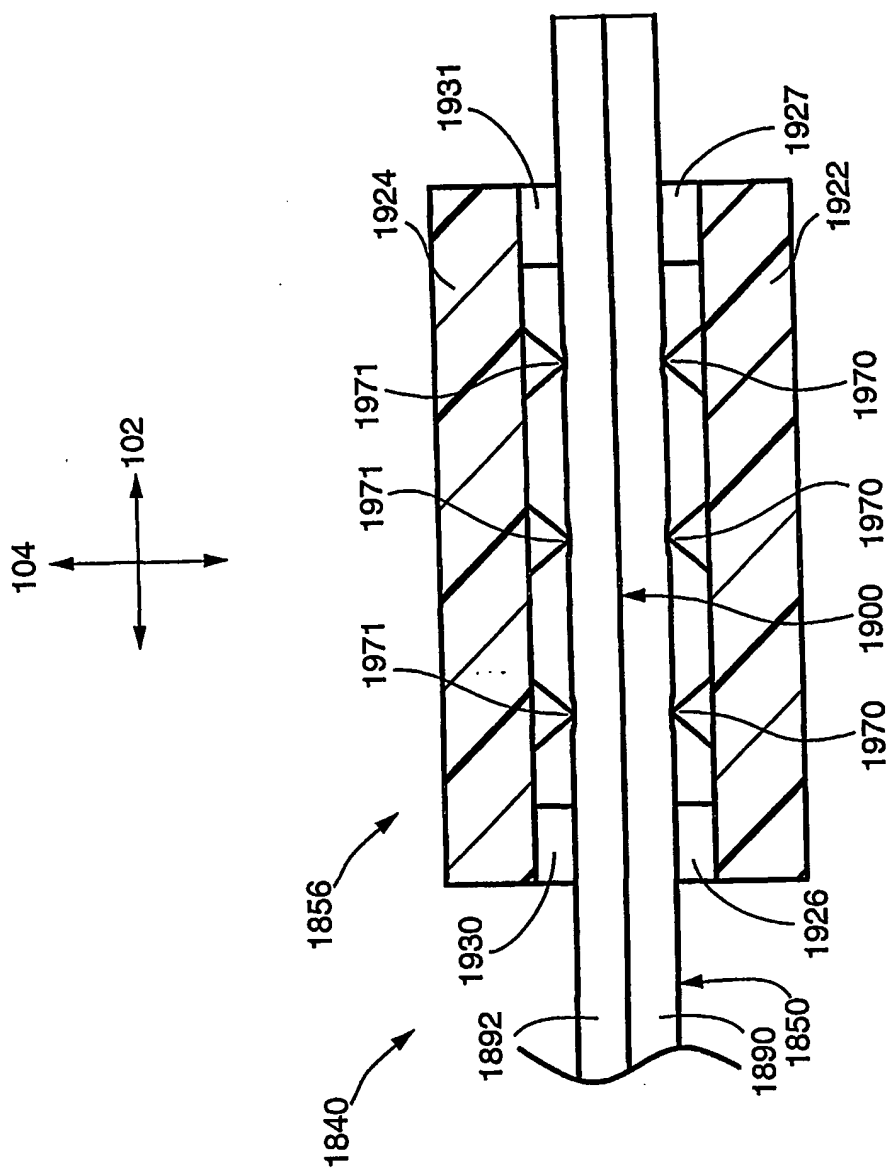


FIG. 21

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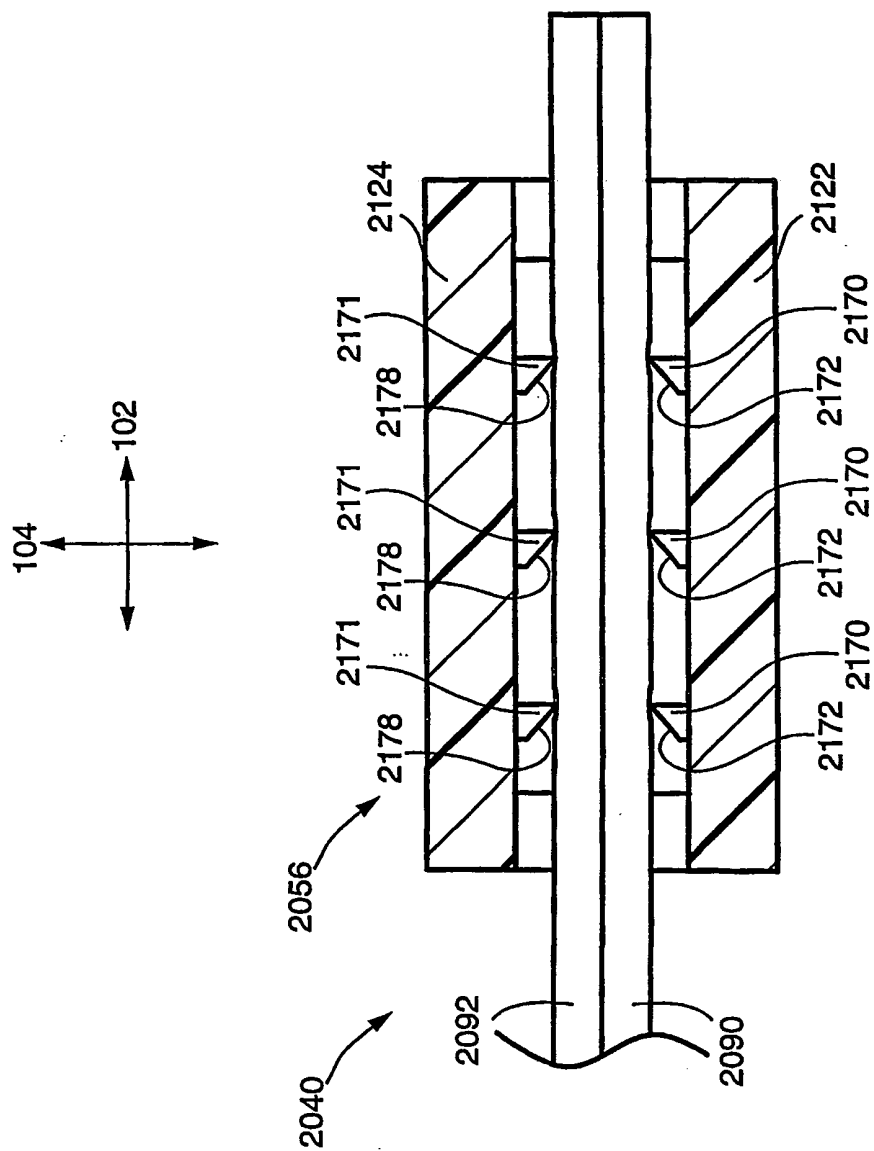


FIG. 22

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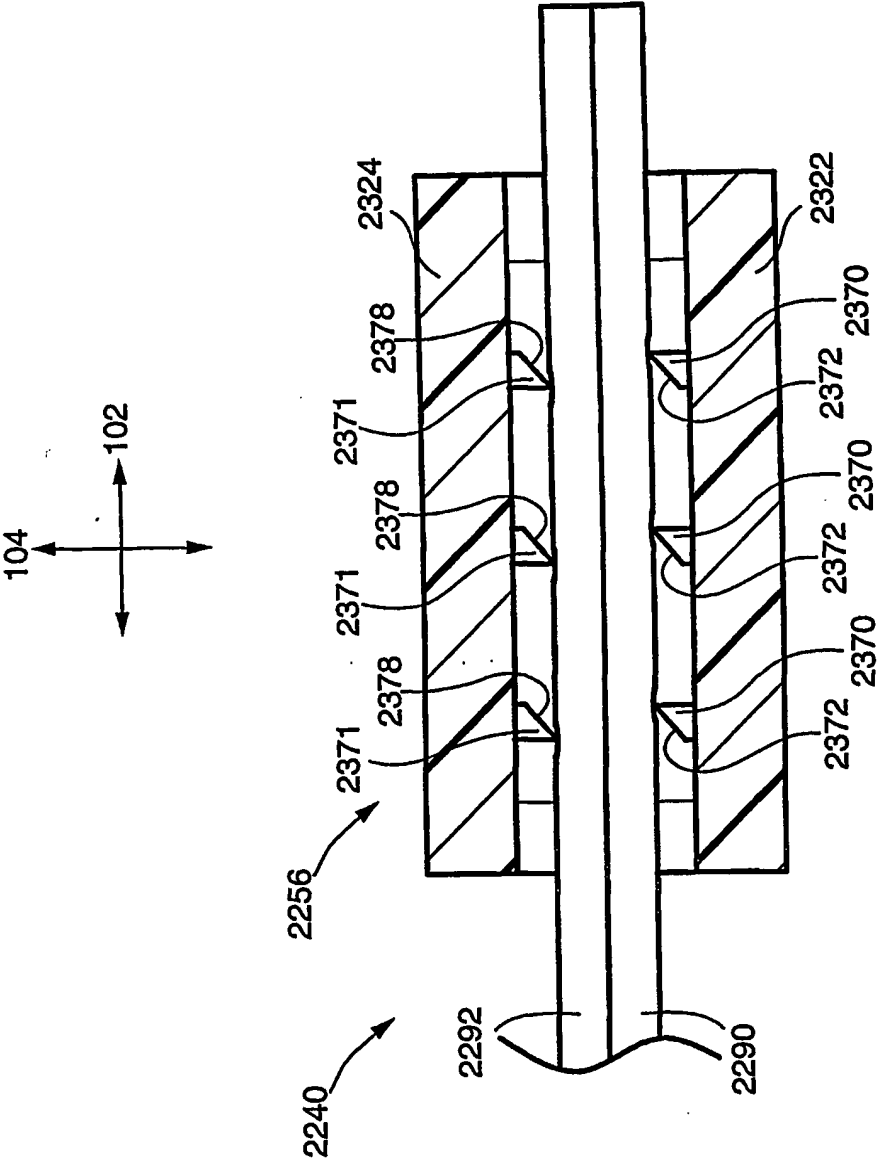


FIG. 23

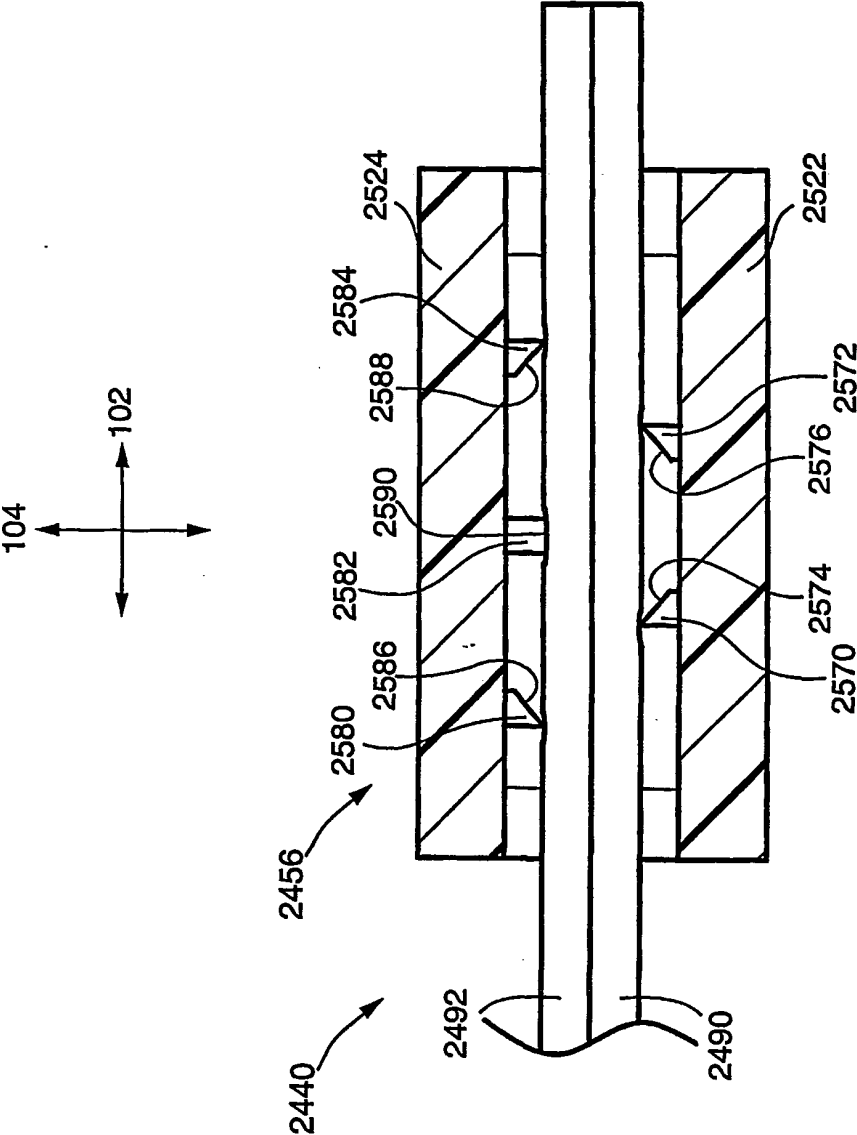


FIG. 24

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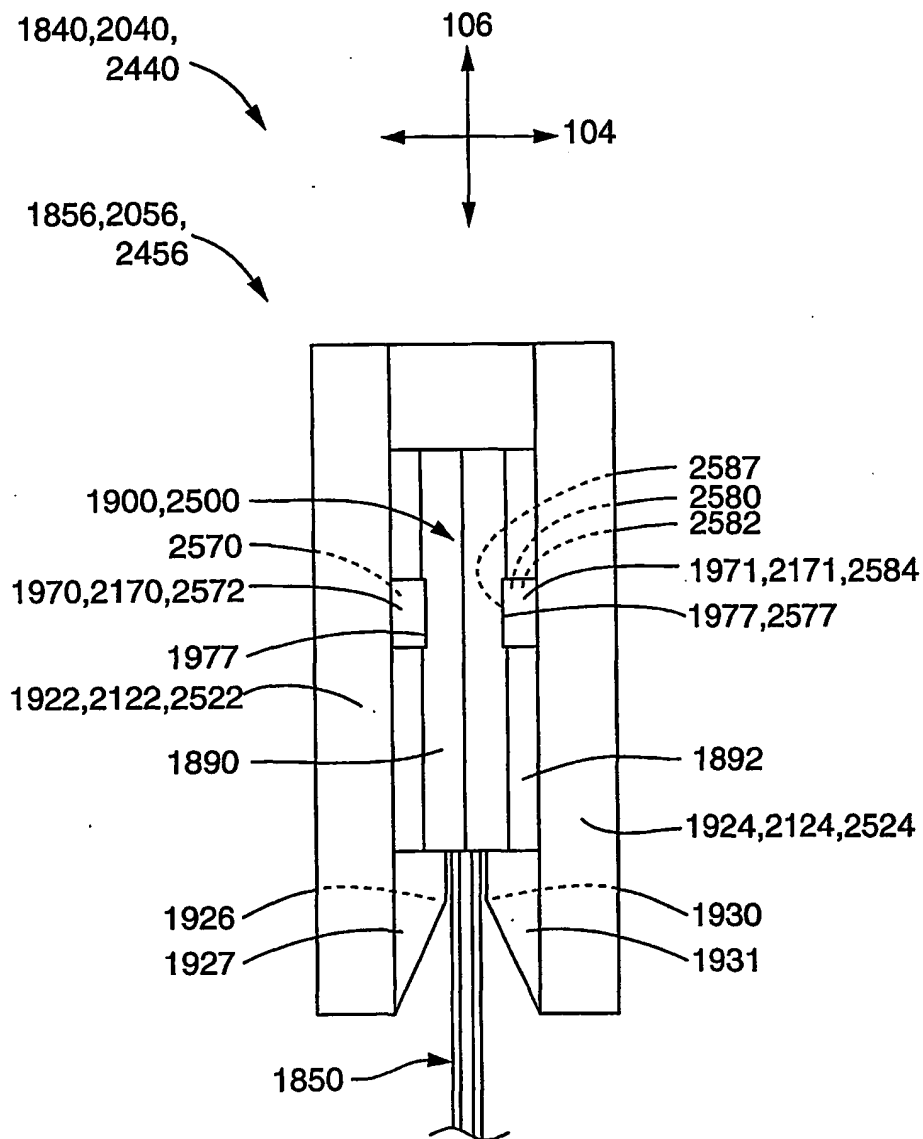


FIG. 25

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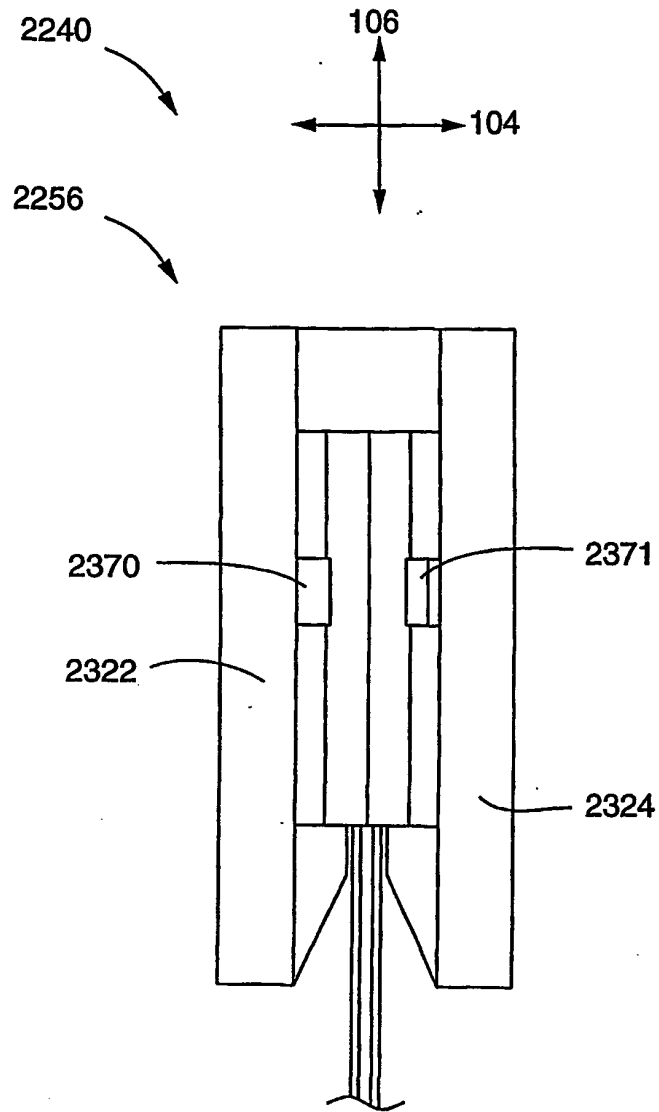


FIG. 26

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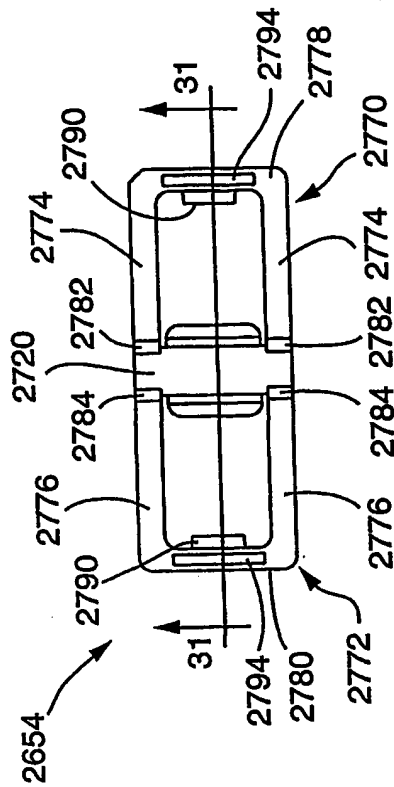


FIG. 28

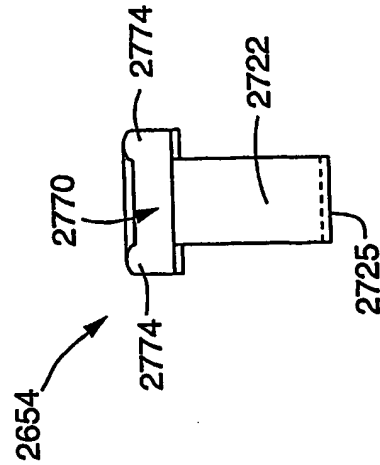


FIG. 30

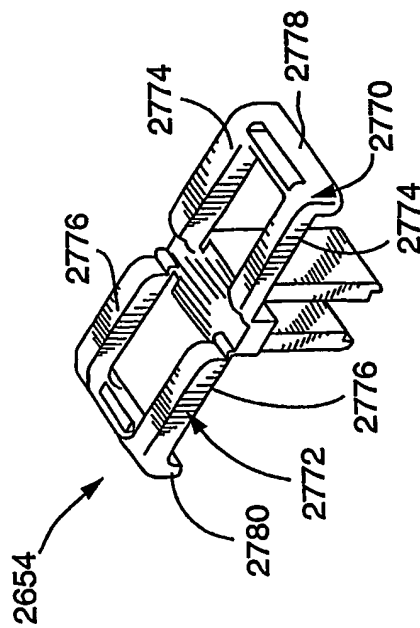


FIG. 27

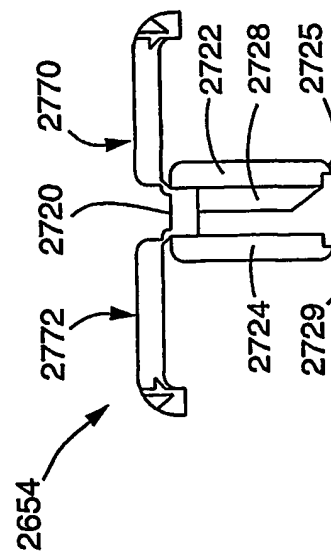


FIG. 29

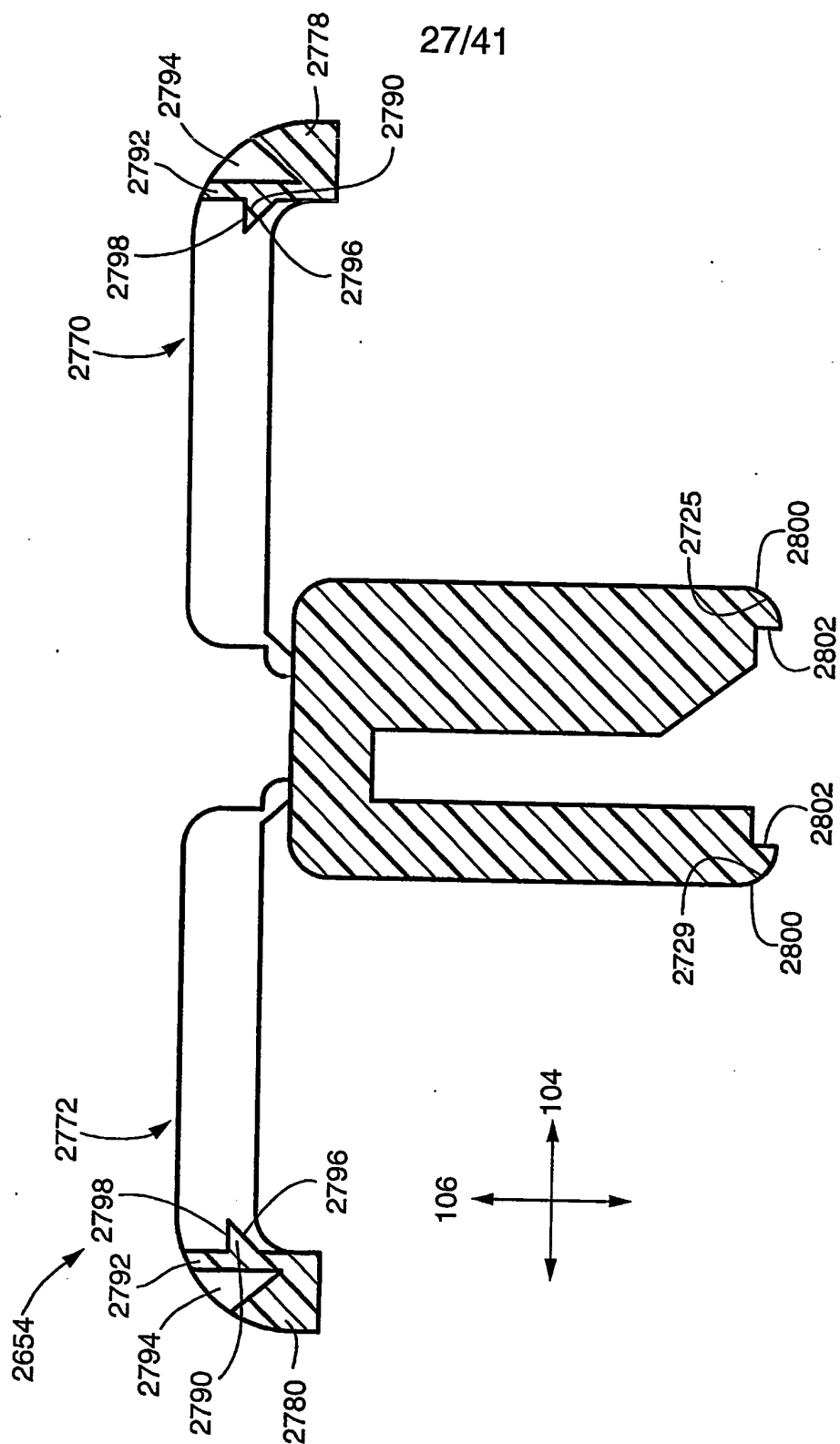


FIG. 31

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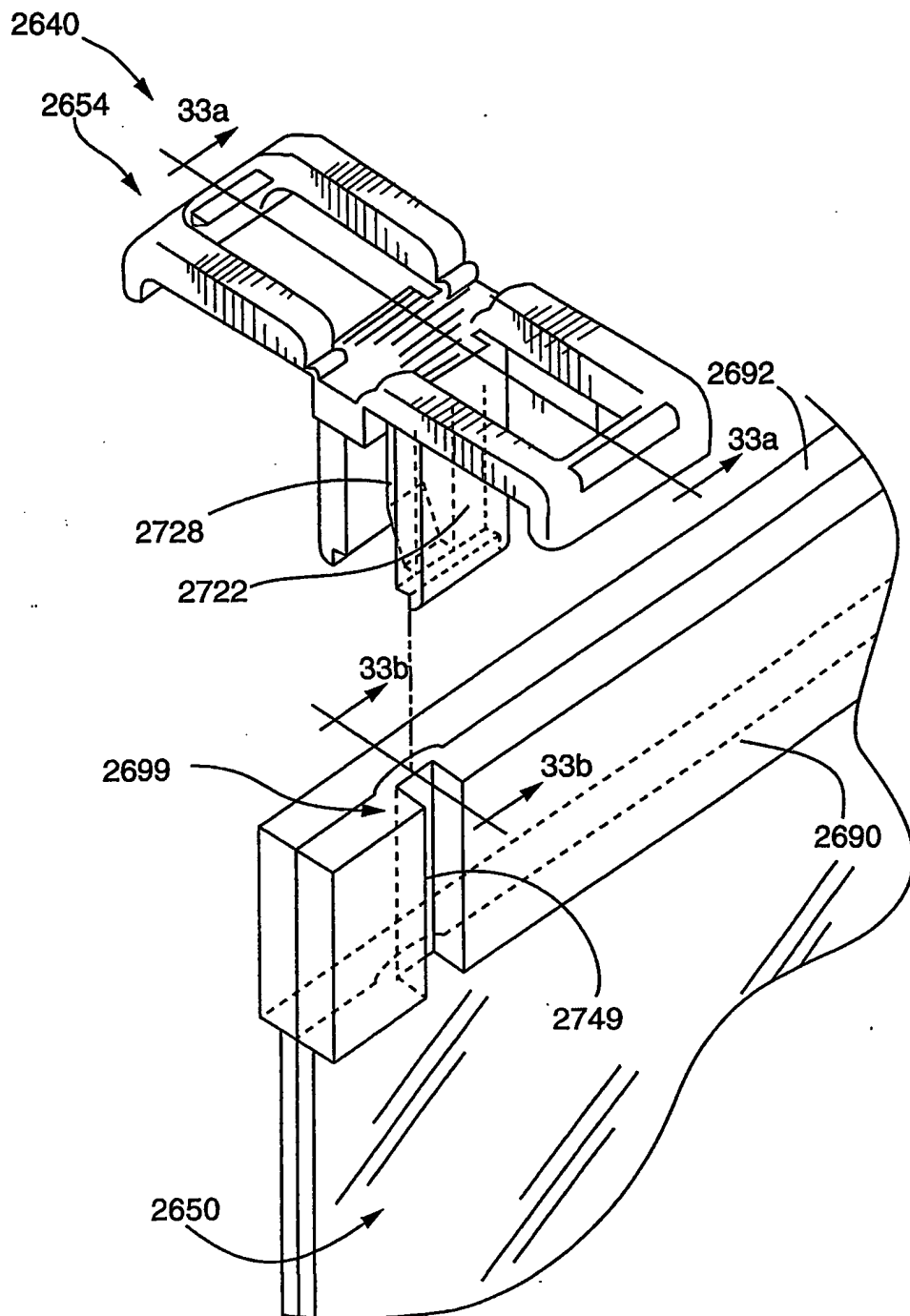
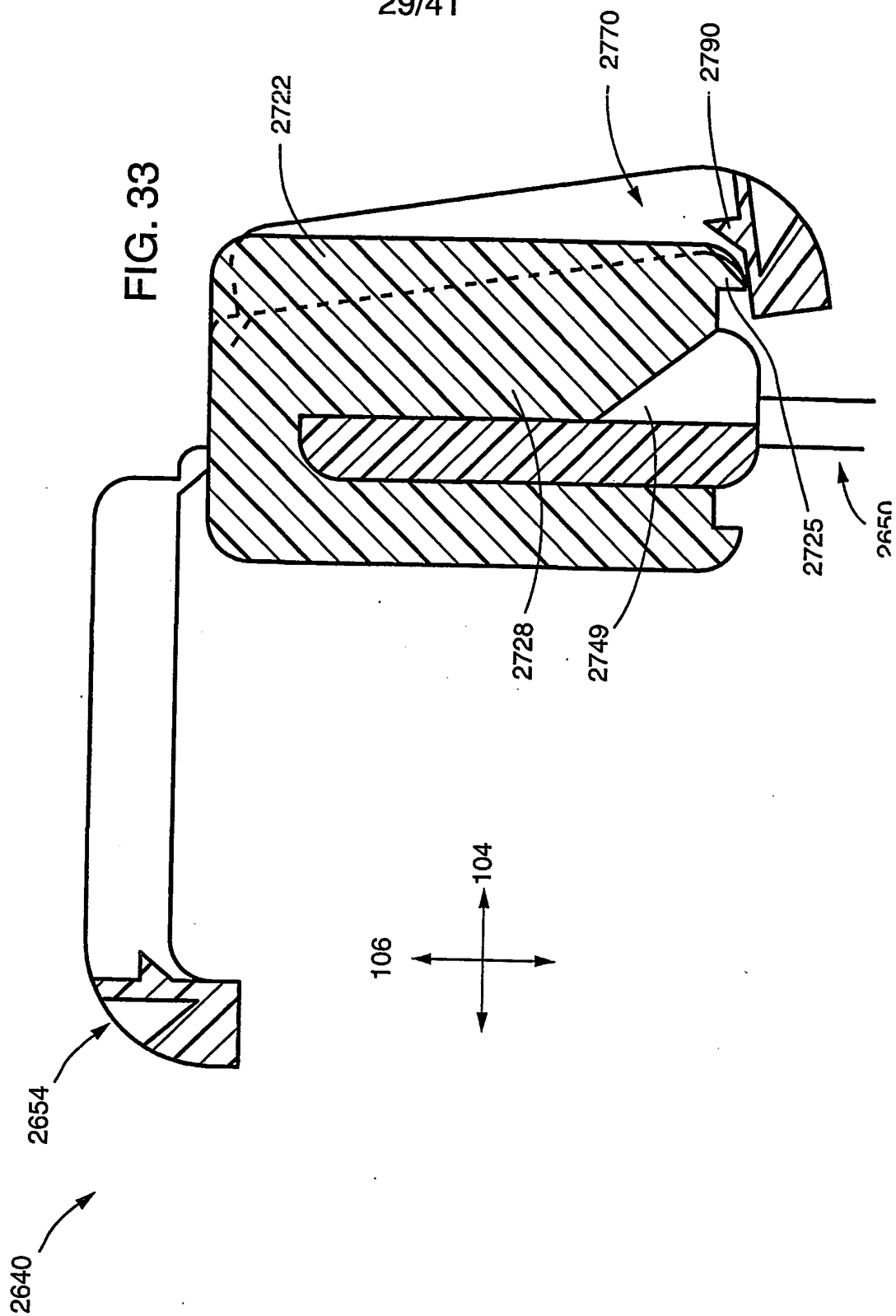


FIG. 32

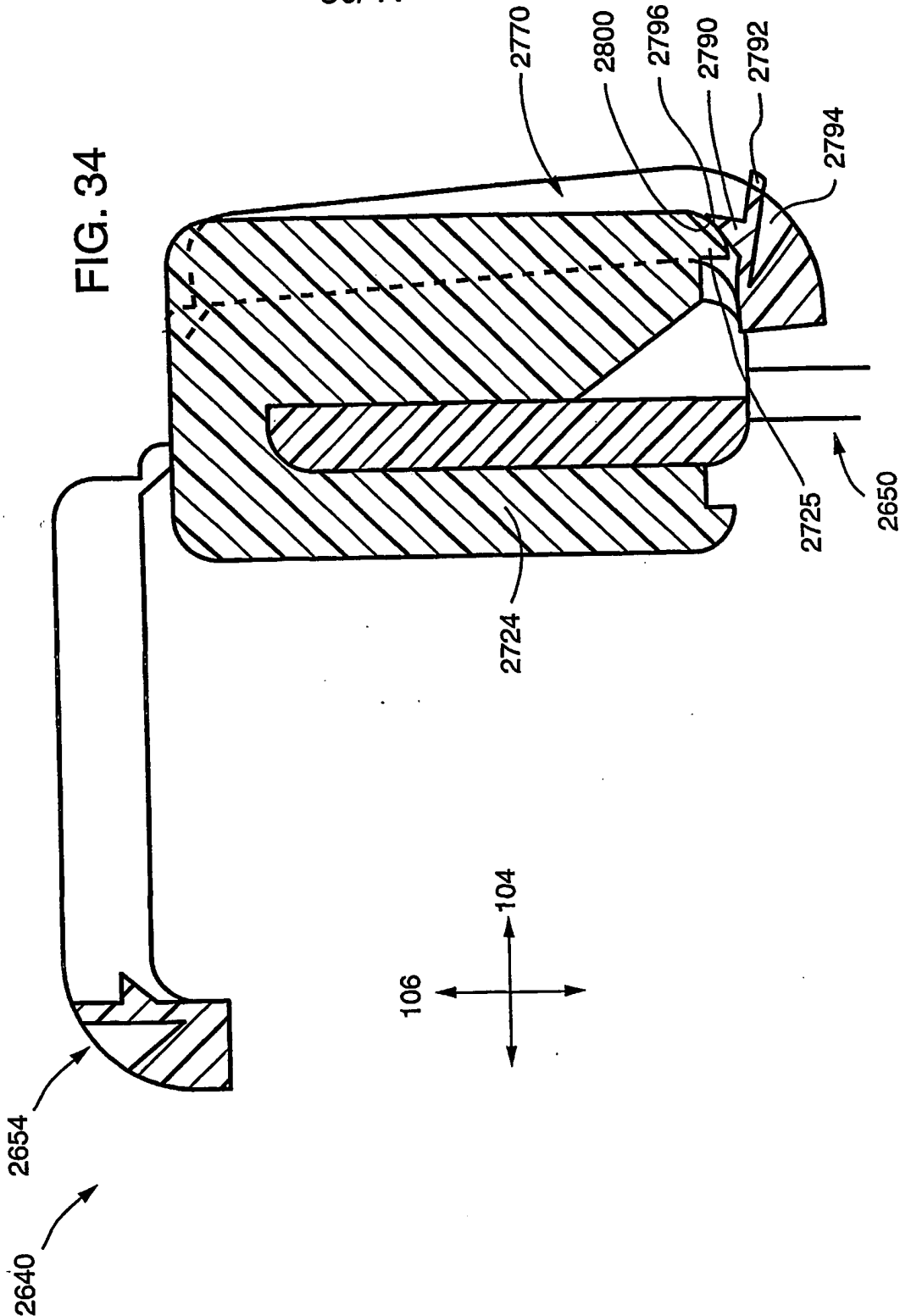
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FIG. 33

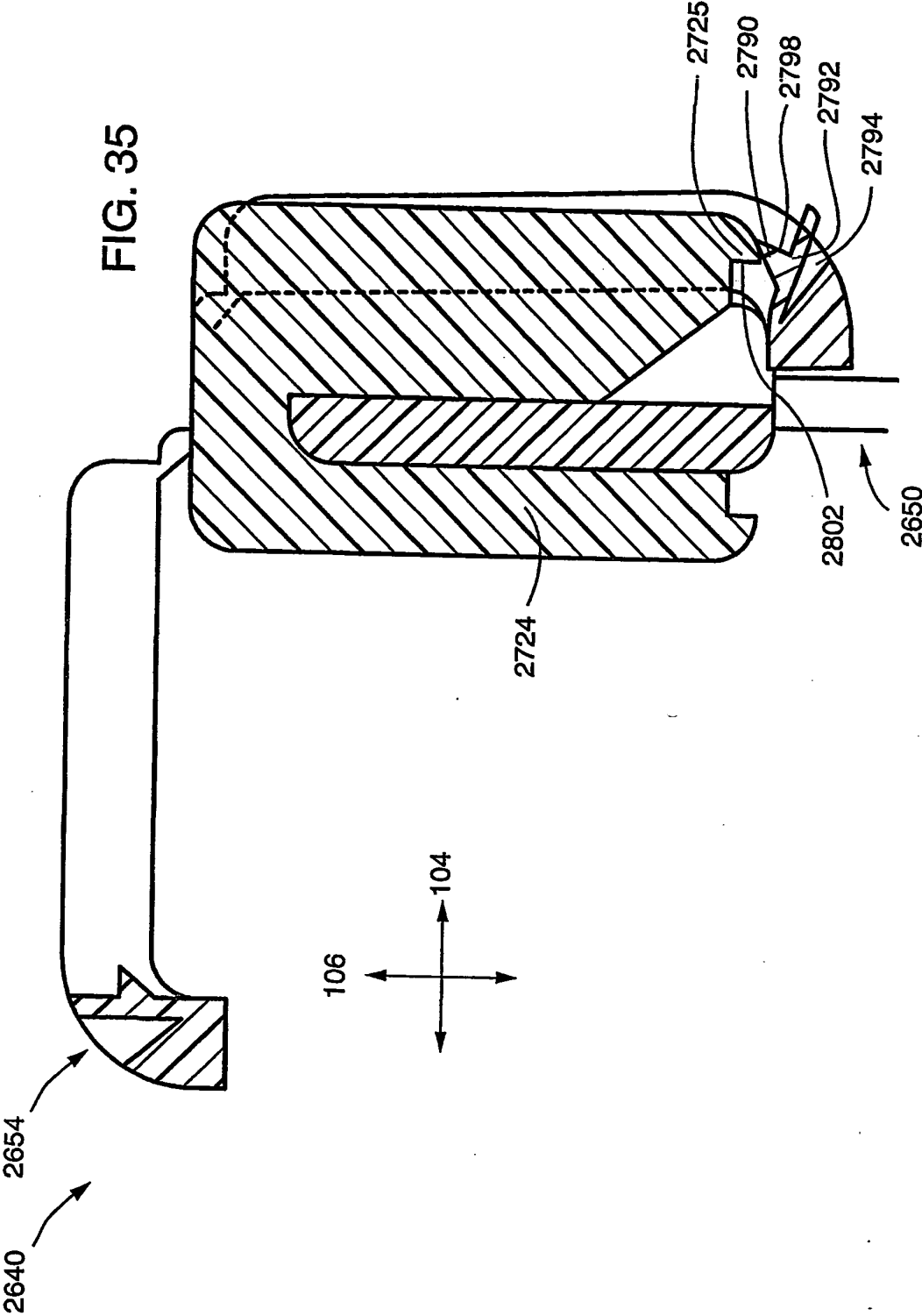


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FIG. 34

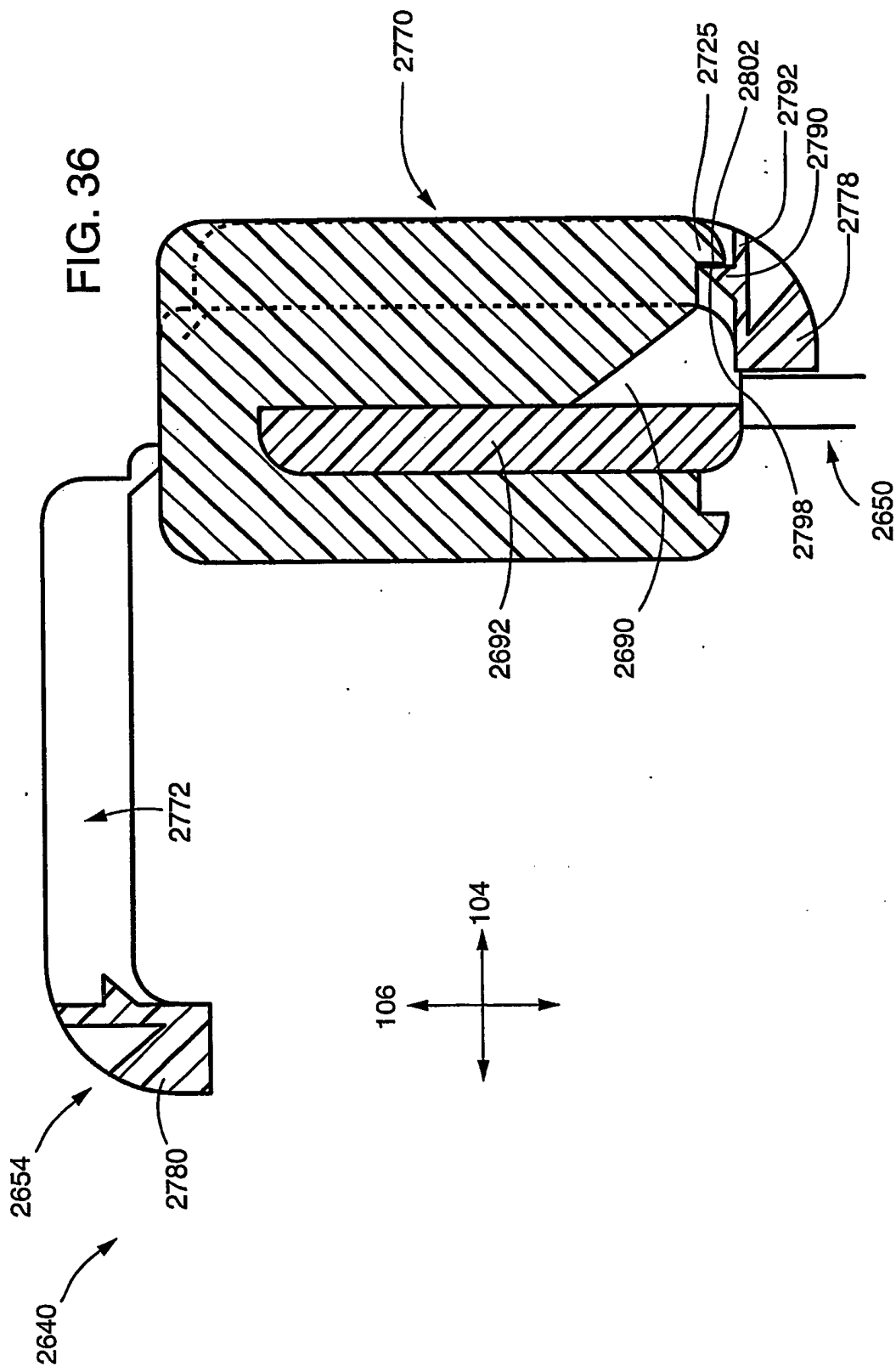


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FIG. 36



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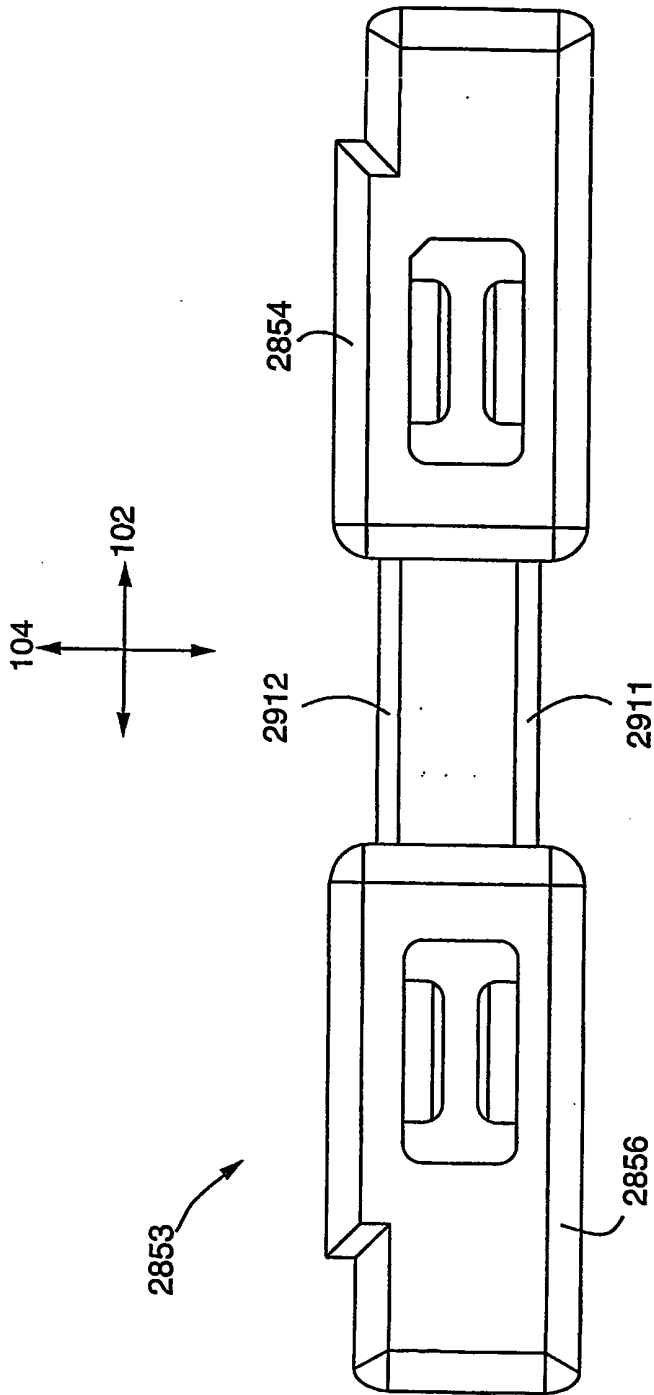


FIG. 37

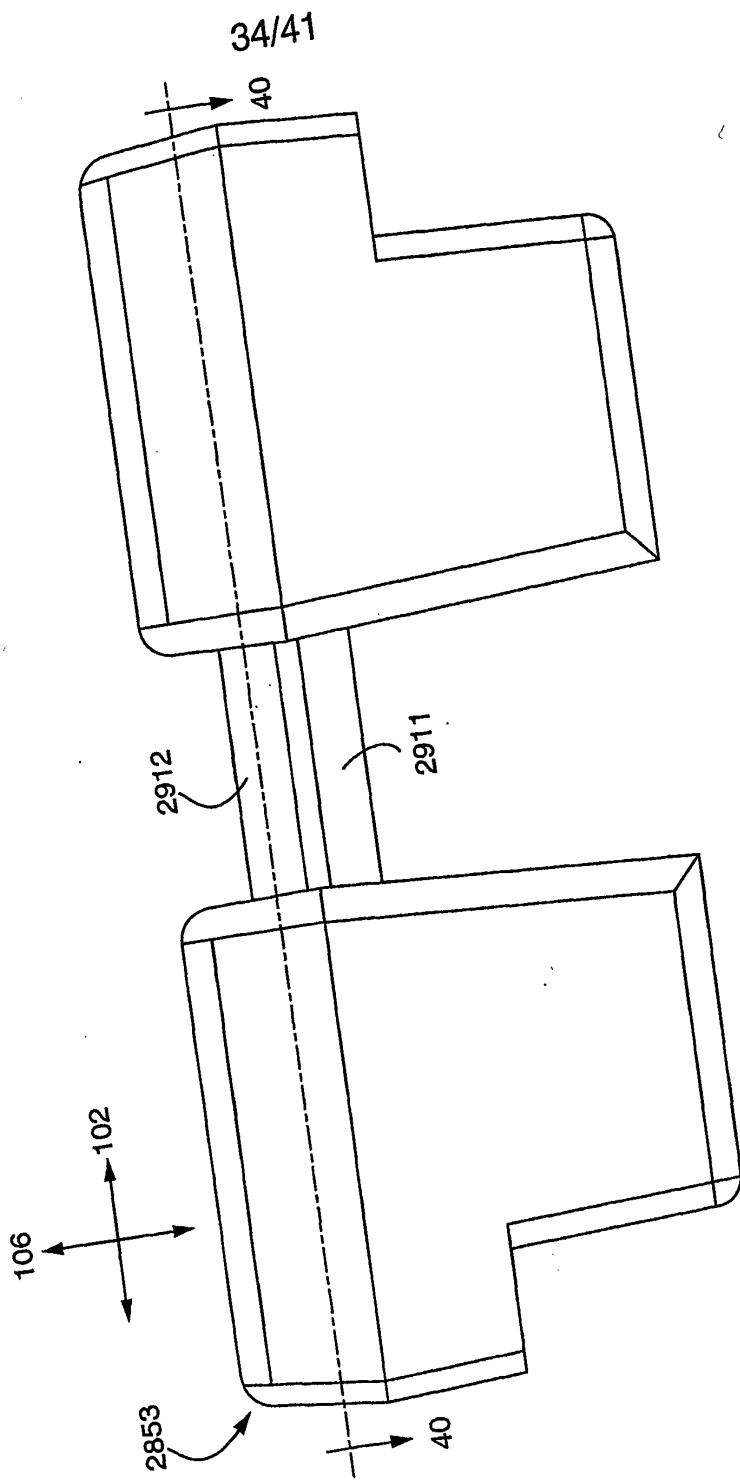


FIG. 38

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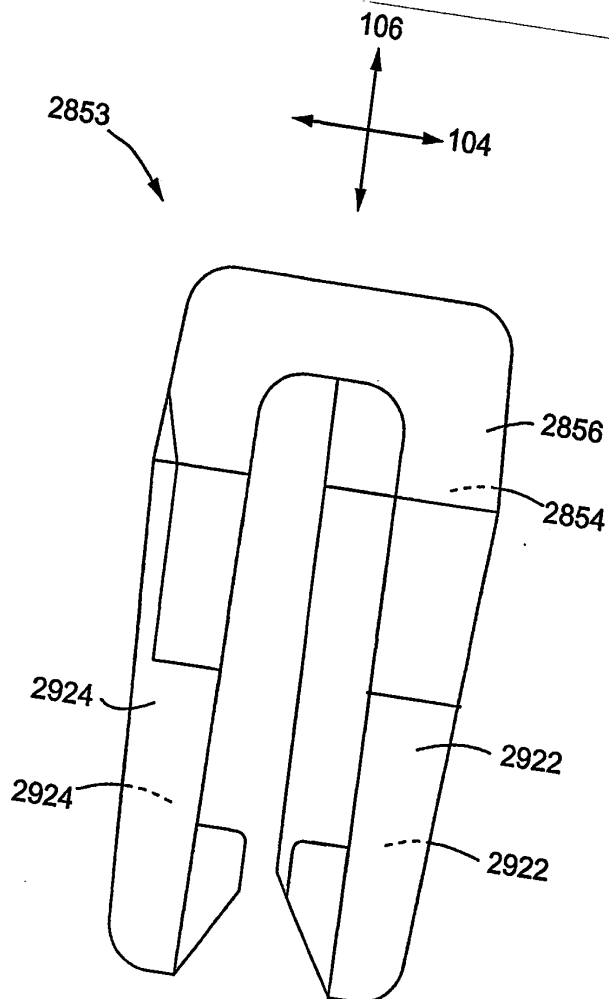
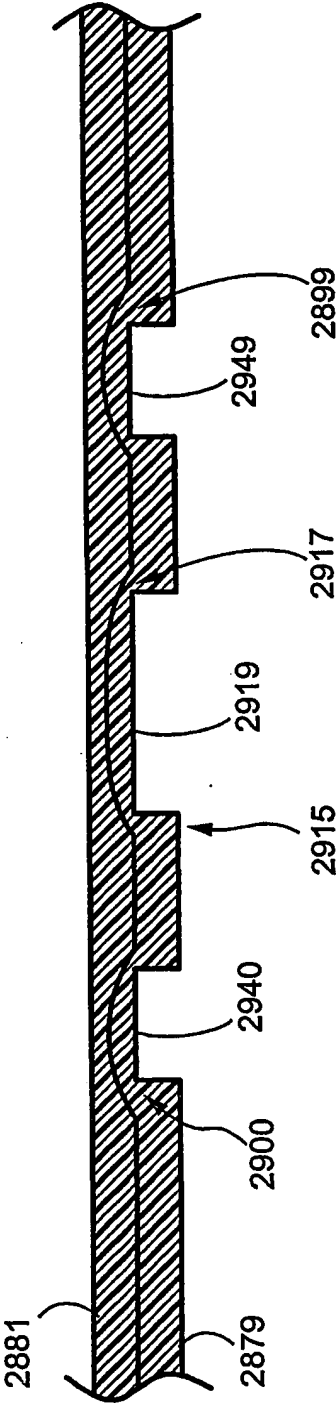
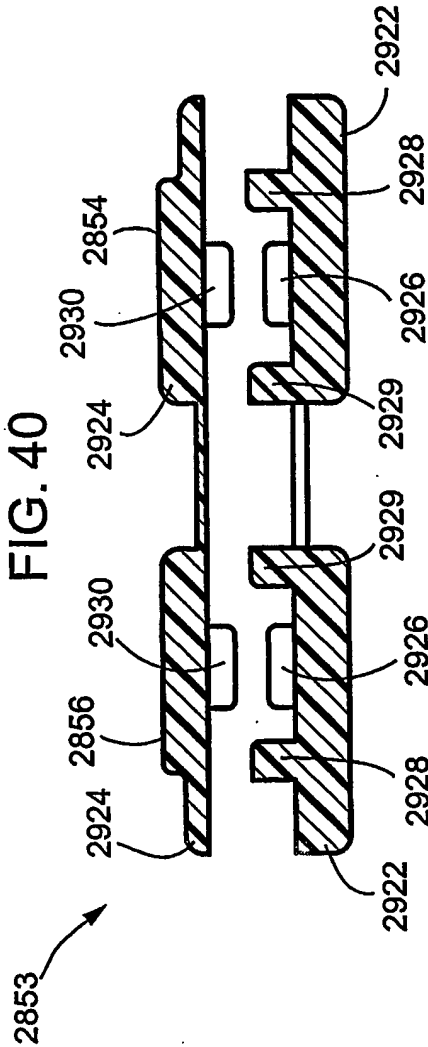


FIG. 39



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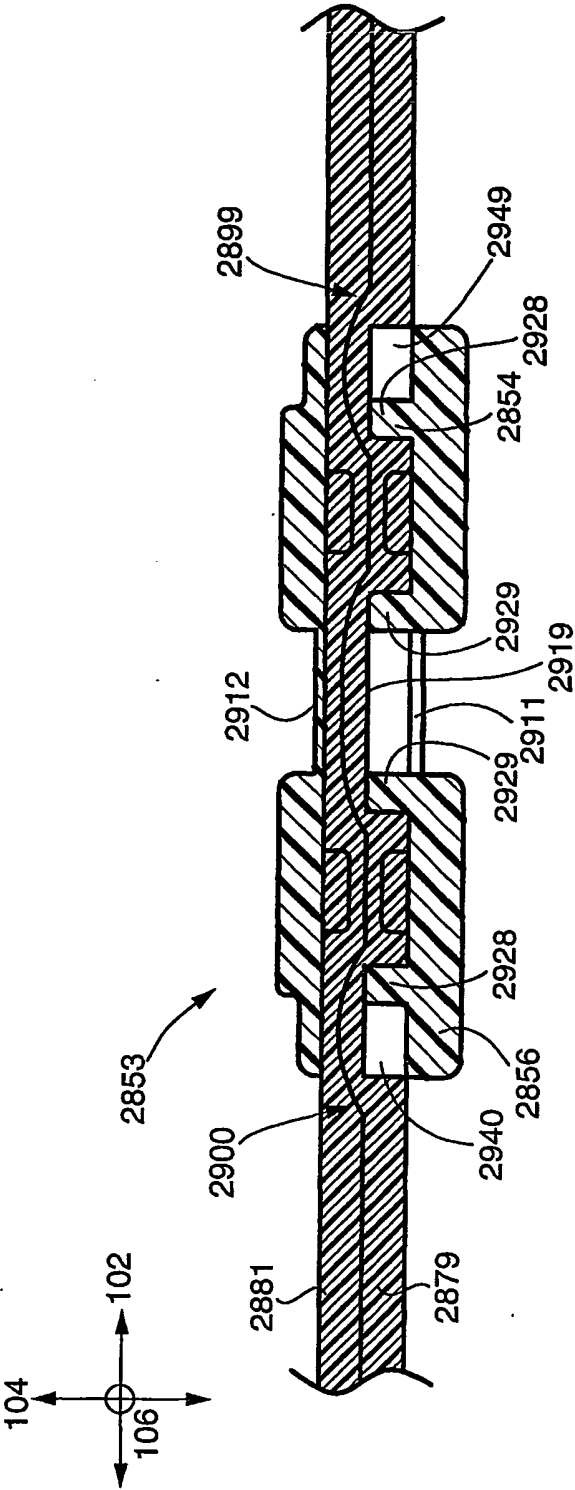


FIG. 42

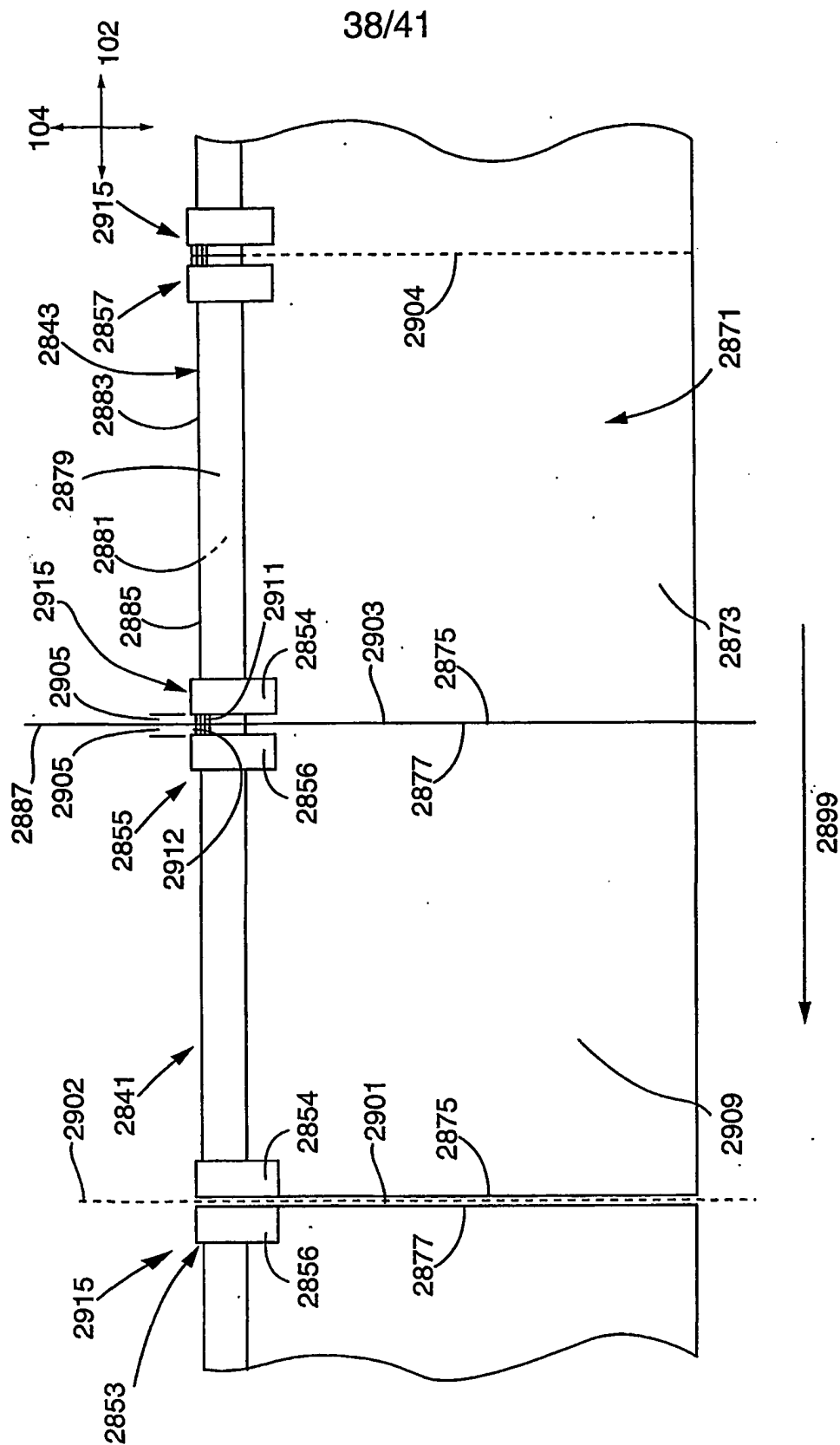


FIG. 43

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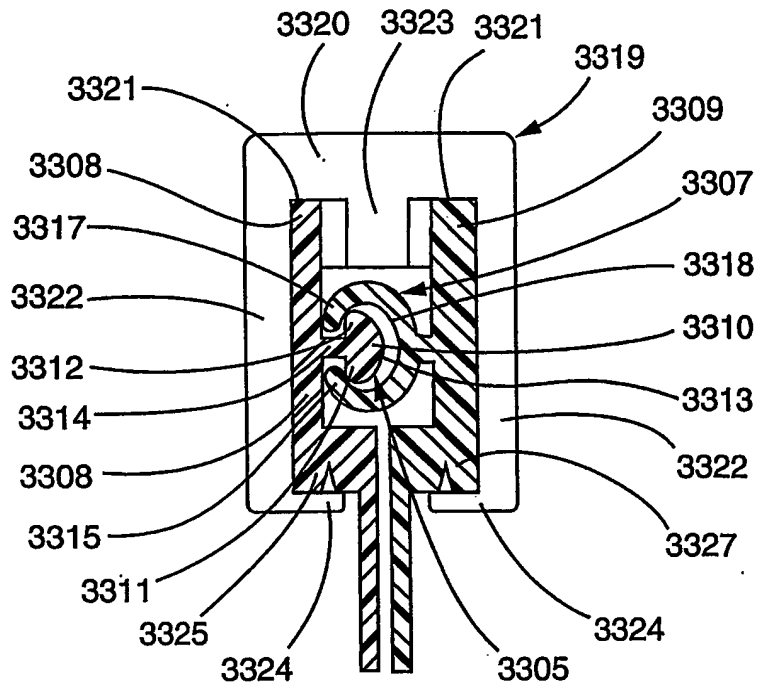


FIG. 45

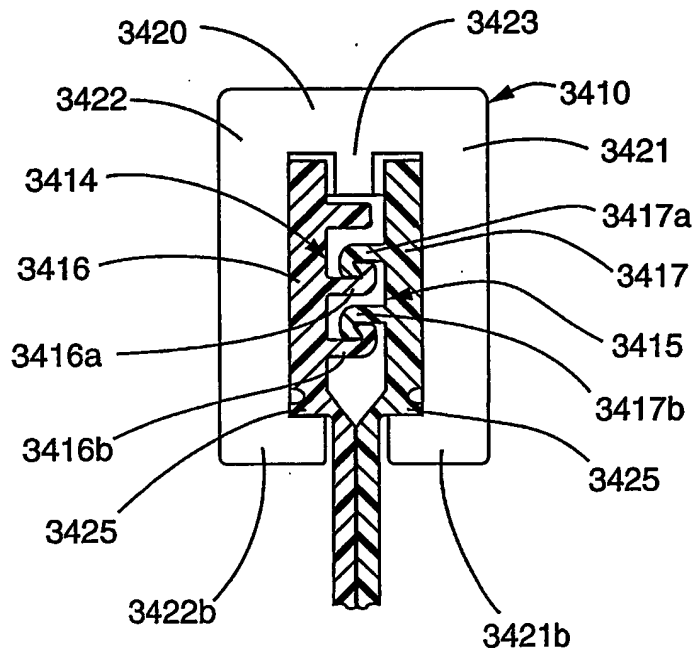
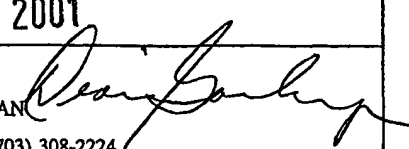


FIG. 46

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/24532

A. CLASSIFICATION OF SUBJECT MATTER IPC(7) : A44B 19/30, 21/00 ; B65D 33/30 ; US CL : 24/435, 433, 436, 400, 587 ; 383/63, 65 According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) U.S. : 24/435, 433, 436, 400, 587, 399, 576, 30.5P ; 383/63, 65 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4,112,553 A (WEITZNER) 12 SEPTEMBER 1978 ; SEE THE ENTIRE DOCUMENT .	1 - 70
Y	US 5,333,362 A (GILLIOZ) 02 AUGUST 1994 ; SEE THE ENTIRE DOCUMENT .	1 - 70
Y	US 4,571,785 A (AKASHI) 25 FEBRUARY 1986 ; SEE THE ENTIRE DOCUMENT .	1 - 70
Y	US 4,660,258 A (HORITA) 28 APRIL 1987 ; SEE THE ENTIRE DOCUMENT .	1 - 70
Y	GB 0,504,716 A (CORNEE ET AL) 19 OCTOBER 1938 ; SEE THE ENTIRE DOCUMENT .	1 - 70
Y	GB 1,174,218 A (LYSTA COMPANY) 17 DECEMBER 1969 ; SEE THE ENTIRE DOCUMENT .	1 - 70
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "B" earlier document published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "A" document member of the same patent family	
Date of the actual completion of the international search 13 NOVEMBER 2000		Date of mailing of the international search report 14 MAY 2001
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230		Authorized officer VICTOR SAKRAN  Telephone No. (703) 308-2224

INTERNATIONAL SEARCH REPORT

Inventor's application No.
PCT/US00/24532

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	GB 2,131,482 A (ASAHI ET AL) 20 JUNE 1984 ; SEE THE ENTIRE DOCUMENT .	1 - 70
Y	US 5,809,621 A (McCREE ET AL) 22 SEPTEMBER 1998 ; SEE THE ENTIRE DOCUMENT .	1 - 70
Y	US 3,806,998 A (LAGUERRE) 30 APRIL 1974 ; SEE THE ENTIRE DOCUMENT .	1 - 70
Y	US 5,077,143 A (BARRACLOUGH ET AL) 31 DECEMBER 1991 ; SEE THE ENTIRE DOCUMENT .	1 - 70
Y	US 5,664,299 A (PORCHIA ET AL) 09 SEPTEMBER 1997 ; SEE THE ENTIRE DOCUMENT .	1 - 70
Y	US 6,088,887 A (BOIS) 18 JULY 2000 ; SEE THE ENTIRE DOCUMENT .	1 - 70
Y	US 5,836,056 A (PORCHIA ET AL) 17 NOVEMBER 1998 ; SEE THE ENTIRE DOCUMENT .	1 - 70
Y	US 5,844,675 A (HAYES ET AL) 01 DECEMBER 1998 ; SEE THE ENTIRE DOCUMENT .	1 - 70
Y	US 5,740,555 A (RENEGAR) 21 APRIL 1998 ; SEE THE ENTIRE DOCUMENT .	1 - 70